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Revision of the subgenus *Morphohaptoderus* Tschitschérine, 1898, in Hubei, China, with descriptions of ten new species (Coleoptera, Carabidae, *Pterostichus*)

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Abstract

The subgenus *Morphohaptoderus* Tschitschérine, 1898, of the genus *Pterostichus* in Hubei is reviewed, with 14 species recognized. Among them, eleven species are distributed in Shennongjia, and the remaining three species are from Wufeng County. Ten new species are described: *Pterostichus* (*Morphohaptoderus*) *quyuani* **sp. nov.** (type locality: Shennongjia, alt. 1700 m), *P.* (*M.*) *lisao* **sp. nov.** (type locality: Shennongjia, alt. 1884 m), *P.* (*M.*) *lingjun* **sp. nov.** (type locality: Shennongjia, alt. 1361 m), *P.* (*M.*) *wangshu* **sp. nov.** (type locality: Wufeng, alt. 900–1000 m), *P.* (*M.*) *yaotiao* **sp. nov.** (type locality: Shennongjia, alt. 1700 m), *P.* (*M.*) *lianquan* **sp. nov.** (type locality: Wufeng, alt. 900–1000 m), *P.* (*M.*) *zhizheng* **sp. nov.** (type locality: Wufeng, alt. 900–1000 m), *P.* (*M.*) *xuanzhang* **sp. nov.** (type locality: Shennongjia, alt. 2700 m), *P.* (*M.*) *rongyu* **sp. nov.** (type locality: Shennongjia, alt. 1361 m), and *P.* (*M.*) *chachi* **sp. nov.** (type locality: Shennongjia, alt. 2500 m). The scientific names of all these new species are derived from Qu Yuan and his poems. All 14 species of the subgenus in Hubei Province are keyed, described, and illustrated. Additional comments on the subgenus *Morphohaptoderus* are also provided, primarily focusing on morphology and species relationships.

Key Words

China, ground beetles, Pterostichini, taxonomy

Introduction

The subgenus *Morphohaptoderus* of the genus *Pterostichus* was established by Tschitschérine (1898) based on two species distributed in China. However, subsequent researchers (Jeannel 1937; Jedlička 1962) incorrectly applied the concept of this subgenus. As a result, several species that were assigned to *Morphohaptoderus* were eventually reclassified into different subgenera, such as *Cryobius* Chaudoir, 1838, *Neohaptoderus* Tschitschérine, 1898, and *Wraseicellus* Shi & Sciaky, 2013. *Morphohaptoderus* was first defined as a natural group within *Pterostichus* by Sciaky (1994), along with a species revision and descriptions of ten new species. Although the critical diagnostic character of this subgenus (metacoxae with three setae) was not mentioned in that work, the species assigned to *Morphohaptoderus* were accurately identified based on their similarities in overall external appearance, the median lobe of the aedeagus, and the right paramere. Building on this definition, seventeen new species were described in subsequent publications (Sciaky 1997; Sciaky and Wrase 1997; Facchini and Sciaky 2003). The subgenus *Morphohaptoderus* had been considered endemic to China until one species from northern Myanmar was described (Wrase and Schmidt 2006). More recently, Fedorenko (2023) further expanded the known distribution by describing three new species from northern Vietnam. Thus, before the present research, a total of 36 described species were included in *Morphohaptoderus*, with 32 of them endemic to China.

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Based on our field investigations in central and southwestern China over the last decade, a large number of *Morphohaptoderus* specimens were collected, representing most of the described species and many undescribed ones. The collection shows that the subgenus *Morphohaptoderus* could be the most diverse subgenus of *Pterostichus* in China, with many new species awaiting description. As the first step in reviewing this large group, we carefully studied numerous specimens collected from two regions in Hubei Province: Shennongjia and Wufeng (Fig. 27). As a result, 14 species were identified, including all four known species and ten additional undescribed ones.

The present paper aims to revise all 14 species of the subgenus *Morphohaptoderus* from Hubei Province, China. Ten new species are described and illustrated, accompanied by a diagnostic key to these 14 species and illustrations of the endophallus for selected species. Moreover, during the study of the previously described species of the subgenus *Morphohaptoderus*, two species are proposed for transfer to the subgenus *Neohaptoderus* Tschitschérine, 1898.

Materials and methods

This work was based on the examination of 365 specimens. Most were collected in Shennongjia and Wufeng, Hubei Province, China; a few were from Wuxi, Wushan, and Chengkou, Chongqing Municipality, which is adjacent to Shennongjia; and only one specimen was from Bazhong, Sichuan Province, located farther from Shennongjia. These specimens, including the types of new species, are deposited in the collections of the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (**IZAS**), and the Forest Entomology Laboratory, Beijing Forestry University, Beijing, China (**CBFU**). Types of the previously described species were examined in the collections of Riccardo Sciaky, Milano, Italy (**CRS**), and Sergio Facchini, Piacenza, Italy (**CSF**).

Most morphological terms in the present paper follow our previous studies (Shi and Liang 2015; Yin et al. 2024). To describe the special structures on the aedeagal apex and venter, several new terms were introduced. Detailed explanations for these are provided in the section on taxonomic notes under the subgenus.

Measurements and abbreviations are as follows: body length (**BL**) was measured from the apical margin of the labrum to the elytral apex; body width (**BW**) was measured along the greatest width of the closed elytra; head width (**HW**) was measured along the greatest width of head, along outer margins of eyes or tempora; pronotum width (**PW**) was measured along its greatest width; pronotum length (**PL**) was measured along its median line; pronotum basal width (**PBW**) was measured along its posterior margin; pronotum apical width (**PAW**) was measured along its anterior margin; elytral length (**EL**) was measured along the suture from the base of the scutellar shield to the elytral apex; length of apical lamella (**AL**) was measured from apical margin of apical orifice to the extreme apex of median lobe; width of apical lamella (**AW**) was measured along base of apical lamella (Fig. 1D); length of lamellar apex (**laL**) was measured from confluence with lamellar denticle and lamellar base to the extreme apex of median lobe; and length of lamellar denticle (**ldL**) was measured from confluence with lamellar apex and lamellar base to the apex of lamellar denticle (Fig. 1C).

Labels of examined material are cited verbatim. Chinese characters in the labels are translated using Pinyin. Detailed information on labels is listed in quotation marks (“”). Individual labels are separated by double slashes (//). Authors’ notes are in brackets ([]). Each specimen of the newly described species bears a printed label “HOLOTYPE [or] PARATYPE taxon name, det. [author(s)], 2025.” Both holotype and paratype labels are in red.

The habitus photographs were taken using a Nikon D7100 camera with a Laowa CF 60 mm f/2.8 2× Super Macro lens. Images of external and male genitalia characters were taken with a Nikon SMZ-18 stereoscopic dissecting microscope fitted with a Nikon D7500 camera. For each final image, several photographs were taken at different focal planes and combined using Zerene Stacker to obtain one synthesized photograph.

Map sources: GIS China Standard Map (Approval Number: GS (2002) 1873) and Ovital (V10.2.6.33409 X64) (Figs 27, 28).

Taxonomy

Tribe Pterostichini Bonelli, 1810
Subtribe Pterostichina Bonelli, 1810
Genus *Pterostichus* Bonelli, 1810

Subgenus *Morphohaptoderus* Tschitschérine, 1898

Chinese vernacular name: 霾通缘步甲亚属

Morphohaptoderus Tschitschérine 1898: 190. [Type species: *Haptoderus maximus* Tschitschérine, 1889, by subsequent designation of Jeannel, 1937: 9]. Jeannel, 1937: 9. Jedlička, 1962: 231. Sciaky, 1994: 1.

Diagnosis. Species of the subgenus *Morphohaptoderus* can be recognized among the Chinese and Southeast Asia *Pterostichus* by the following combination of characters: body relatively short and wide; elytra elliptic and depressed, not parallel-sided, surface usually iridescent or shagreened (only in females); dorsum dark reddish brown to black; basal foveae of pronotum usually with distinct inner and outer sulci; metacoxae with three setae; fifth tarsomeres usually setose ventrally; metepisternum not longer than wide; right paramere very short, apex rounded (except for *Pterostichus dundai* Sciaky, 1994); apex of aedeagus often hooked or denticulate.

Subgeneric characters. Small to medium-sized *Pterostichus* (4.6–12.6 mm); elytra elliptic, slightly

arcuate laterally, not parallel-sided; dorsum dark reddish brown to black; males usually with linear microsculpture (Fig. 1H) on elytra, often forming iridescent luster; females sometimes with matte elytra formed by granular microsculpture (Fig. 1I). Head relatively small to slightly thickened, always narrower than pronotum; submentum with one or two setae on each side; antennae reaching or slightly exceeding elytral base, antennomere 3 with a few long primary setae forming an apical ring (Fig. 1B), sometimes also with short accessory setae along inner margin (Fig. 1A). Pronotum various in shape, mostly nearly circular; posterior angles often distinct but highly variable across different species; basal foveae shallow, usually forming distinct inner and outer sulci, with area between lateral margin and outer sulcus often relatively flat and not ridged. Elytra flat and oblong, striae usually relatively deep; parascutellar stria absent or present; elytral humerus usually with a tooth; interval 3 often with one to five setigerous pores but without setigerous pores in *P. glabellus* Fedorenko, 2023, and some undescribed species from China. Length of metepisternum approximately equal to its basal width. Sternite VII with one seta on each side in males and two in females; male sternite VI or VII usually without secondary sexual modification, seldom with shallow depression or wrinkles (Fig. 2). Metacoxae with three setae, the medial-posterior seta present (Shi and Liang 2015: fig. 137); metatrochanters with a seta; fifth tarsomeres often setose ventrally (Fig. 1F–G), asetose in some species from eastern China and Vietnam (Fig. 1E). Apical orifice of aedeagus deviated to left; shape of apical lamella variable among different species, often hooked, denticulate, or twisted; right paramere very short, apex rounded (except for *P. dundai* Sciaky, 1994). Gonocoxite 2 of female ovipositor falciform, outer margin with two to four ensiform setae, dorsal margin with one to three ensiform setae, ridged distal to the seta.

Recognitions among Chinese subgenera of *Pterostichus*. In most Chinese subgenera of *Pterostichus*, the metacoxa bears two lateral setae: one close to the posterior angle and the other to the anterior margin (setae 1 and 2 in Shi and Liang 2015: fig. 137). However, four Chinese subgenera possess an additional seta near the medial angle (seta 3 in Shi and Liang 2015: fig. 137): *Tschitscherinea* Berg, 1898, *Morphohaptoderus* Tschitschérine, 1898, *Cryobius* Chaudoir, 1838, and *Huaius* Tian & Huang, 2019. Based on this synapomorphy and phenetic similarities, these four subgenera are hypothesized to be more closely related to each other than to other subgenera in the Chinese fauna. Among them, members of *Morphohaptoderus* can generally be recognized by their relatively stout body form and the very short right paramere of the male genitalia. Nevertheless, these diagnostic characters are not universally applicable to all species of the subgenus, suggesting that the group may not be monophyletic. Detailed comparisons among *Morphohaptoderus*, *Tschitscherinea*, and their relatives were provided in our previous study (Yin et al. 2024).

After examining the type specimens of two species, *P. megaloderus* Sciaky, 1994, and *P. yulongshanensis* Sciaky, 1997 (Fig. 30A, B), which were previously assigned to the subgenus *Morphohaptoderus*, it was found that they do not conform to this subgenus in terms of two key characteristics: the metacoxae with only two setae, with the medial seta absent (Fig. 30F); and the apex of the right paramere slightly pointed (Fig. 30E). These characteristics, together with the general features of their habitus and male genitalia, indicate that these two species are closely related to some members of the subgenus *Neohaptoderus*, such as *P. berezowskii* Tschitschérine, 1898. Therefore, the following new subgeneric assignments are proposed herein: *P.* (*Neohaptoderus*) *megaloderus* and *P.* (*Neohaptoderus*) *yulongshanensis*. Thus, prior to the present study, the subgenus *Morphohaptoderus* comprised 34 species.

Distribution and diversity. Including the ten new species described in this study, the subgenus *Morphohaptoderus* now comprises a total of 44 species. Most of them (40 species) are endemic to China, distributed across Yunnan, Sichuan, Shaanxi, Gansu, Guizhou, Hubei, and Chongqing provinces, with an exceptionally high species richness in Sichuan, Shaanxi, and Hubei. Additionally, three species are distributed in northern Vietnam (Fedorenko 2023), and one species occurs in northern Myanmar (Wrase and Schmidt 2006).

In Sichuan and Yunnan, species of *Morphohaptoderus* generally inhabit cloud forests at relatively high altitudes, ranging from approximately 3000 to 4000 m. In eastern provinces such as Hubei and Chongqing, some species occur at lower altitudes, even below 1000 m. Based on our examined specimens, numerous new species await description.

Taxonomical notes. Prior to the present research, we had studied all described species of *Morphohaptoderus* from China. The following characters are considered important both for species determination and for inferring phylogenetic relationships: setae on the submentum, number of setigerous pores on elytral interval 3, and the median lobe of the aedeagus, particularly the modification of the apical lamella and the presence of ventral ridges.

In most members of *Pterostichus*, the submentum has two setae on each side: a longer medial seta and a shorter lateral seta. In some cases, the lateral seta may be absent, resulting in only one seta on each side of the submentum. Based primarily on this character, the Chinese species of *Morphohaptoderus* can be classified into two major groups. **Division I:** The submentum has two setae on each side. Species in this group tend to have smaller body sizes; if the apical lamella of the aedeagus is modified, it is hooked on the right margin; elytral interval 3 has two or more (usually three or four) setigerous pores, with the basal pore always adjacent to stria 3. Fifteen described species belong to this group, primarily distributed in the high-altitude Hengduan Mountain System in Sichuan and Yunnan provinces, with a few also occurring in Shaanxi and Gansu. **Division II:** The submentum has only one

seta on each side. Species in this group exhibit a body size range from very small to large; the apical lamella of the aedeagus is often modified, with a denticle on the left margin; the median lobe of the aedeagus often has ventral ridge; and elytral interval 3 normally has three or fewer (usually two) setigerous pores, all of which are often adjacent to stria 2 (except for three species in Hubei). Twenty-five described species belong to this group, including all 14 species distributed in Hubei, seven additional species of the *maximus* group (defined below), and four remaining species: *P. schuelkei* Sciaky & Wrase, 1997, *P. wenxianensis* Allegro & Sciaky, 2010, *P. janatai* Sciaky & Wrase, 1997, and *P. parvicollis* Sciaky & Wrase, 1997. These species are primarily distributed in the relatively low-altitude Qinling Mountain System in Hubei and Shaanxi, with a few also occurring in mountainous regions of southern China.

In Division II, 13 species share a similar aedeagus type, characterized by a large denticle on the left margin of the median lobe and a strongly downward-bent apex of the apical lamella (Figs 1C, 12, 13). A species group named the *maximus* group is proposed for these species, as this group is clearly monophyletic based not only on the above specific characters of the male genitalia but also on the following: the ventral margin of the aedeagus is more or less ridged; females often exhibit granular microsculpture on the elytra, giving them a shagreen appearance; and elytral interval 3 usually has two setigerous pores, with the first pore always adjacent to stria 2. Compared with other species in Division II, *P. hubeicus* Facchini & Sciaky and *P. yaotiao* sp. nov. are most closely related to the *maximus* group, as they also possess a denticle (although very small and indistinct) on the left margin of the apical lamella of the aedeagus.

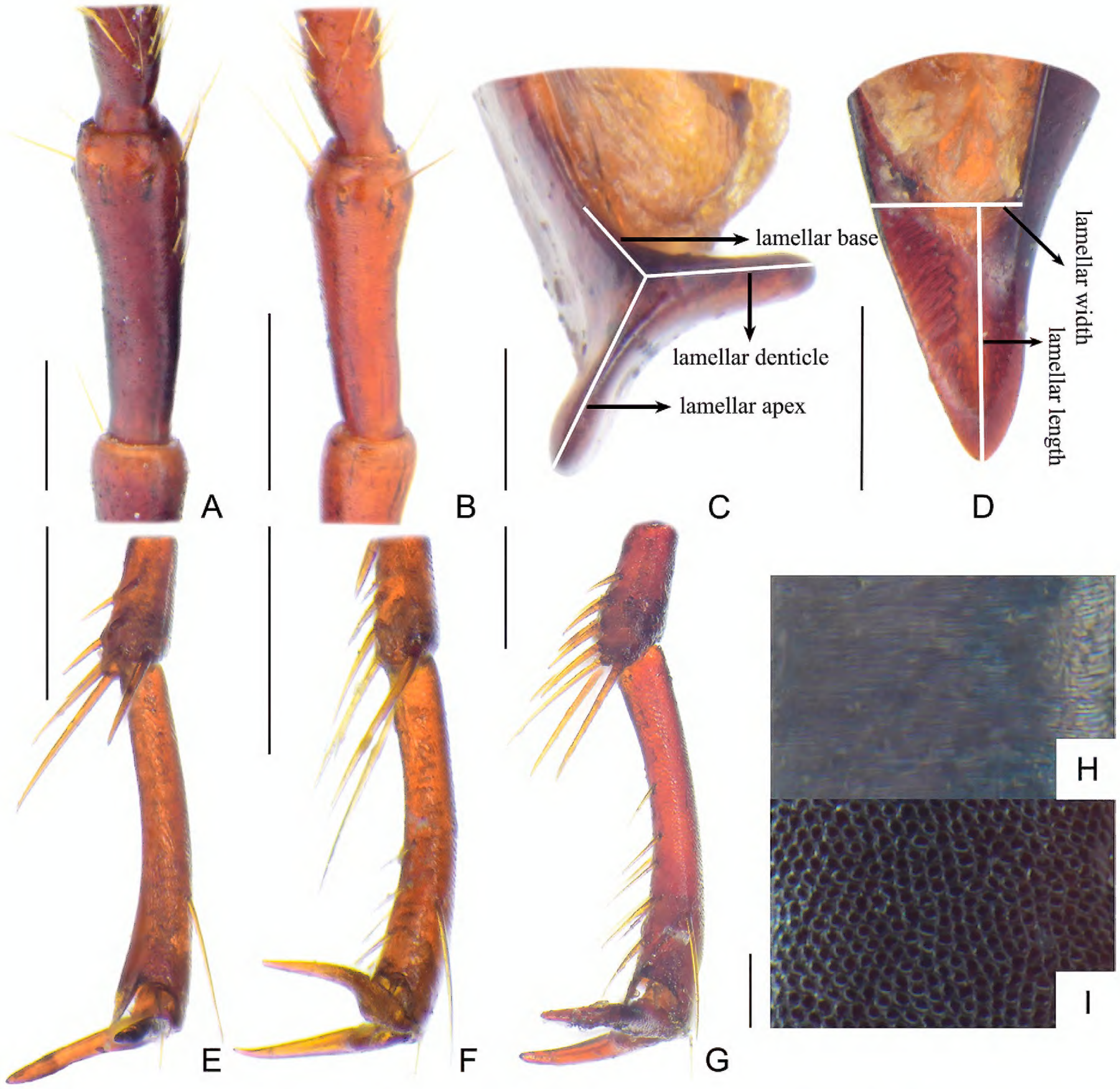

Figure 1. Characters of *P.* (*Morphohaptoderus*) spp. **A.** Antennomere 3 of *P. wangshu* sp. nov. **B.** Antennomere 3 of *P. yaotiao* sp. nov. **C.** Apical lamella of *P. lisao* sp. nov. **D.** Apical lamella of *P. lianquan* sp. nov. **E.** Fifth tarsomere of *P. yaotiao* sp. nov. **F.** Fifth tarsomere of *P. hubeicus*; **G.** Fifth tarsomere of *P. shennongjianus*; **H.** Elytral microsculpture of *P. dentellus*; **I.** Elytral microsculpture of *P. shennongjianus.* Scale bars: 0.25 mm (**A–G**); 0.05 mm (**H–I**).

Except for the six species from Hubei (the first six species in the present paper), the following seven species also belong to the *maximus* group: *P. maximus* Tschitschérine, 1889; *P. dundai* Sciaky, 1994; *P. huashanus* Sciaky, 1994; *P. lingshanus* Sciaky & Wrase, 1997; *P. chungkingi* Jedlička, 1932; *P. irideus* Sciaky, 1994; and *P. guizhouensis* Sciaky, 1997. The first four species listed are distributed in the Qinling Mountains, with one species (*P. maximus*) from Gansu and the remaining species from Shaanxi. The last three species are distributed in three isolated mountain ranges: Jinfo Mountain (Chongqing), Emei Mountain (Sichuan), and Fanjing Mountain (Guizhou).

To facilitate descriptions of male genitalia in the *maximus* group, it is necessary to introduce three morphological terms: lamellar denticle is used to describe the tooth-like structure formed by the upward bending of left margin of apical lamella; lamellar apex refers to the portion of apical lamella located distally from the base of lamellar denticle; and lamellar base refers to the portion of apical lamella located proximally to the lamellar denticle (Fig. 1C). When describing species in the *maximus* group, the lengths of these three parts were measured to characterize variations in the apical lamella. Measurements were taken from the intersection points of their axes in the left lateral view, extending to the apical margin of the apical orifice and to the apical tips of the lamellar apex and lamellar denticle (Fig. 1C).

In the *maximus* group, the ventral surface of the median lobe of the aedeagus typically bears three ridges. The right ridge is located on the right-ventral margin of the median lobe (the right-ventral margin corresponds to the left side of the median lobe in ventral view). When entire, it extends from the aedeagal base to the extreme apex, forming a continuous margin on the right-ventral side of the basal portion and apical lamella; however, it is partially absent in many species. The median ridge is positioned along the midline of the ventral surface. When entire, its base does not reach the aedeagal base, and its apex extends at most to the midlevel of the apical orifice. The left ridge is situated on the left-ventral margin of the median lobe. Its base nearly reaches the aedeagal base, with a straight or sinuate structure near the base, and the apex terminates at the left-basal corner of the apical orifice. Among the six Hubei species of the *maximus* group, all three ridges described above are fully developed only in *P. lisao* sp. nov. (Fig. 14B, C). In the other species, some ridges are absent or poorly defined.

Key to species of subgenus *Morphohaptoderus* Tschitschérine, 1898 from Hubei

1 Elytral interval 3 with two or more setigerous pores 2
– Elytral interval 3 with only one setigerous pore near midpoint of elytra 13
2 Elytral interval 3 with two to five setigerous pores, all adjacent to stria 2 (in a few specimens of *P. shennongjianus*, there may be one pore on middle of interval or adjacent to stria 3, but the basal one always adjacent to stria 2) 3
– Elytral interval 3 with three setigerous pores, the basal one adjacent to stria 3 (in two paratypes of *P. xuanzhang* sp. nov., the basal discal pore adjacent to stria 2 on one side), other two adjacent to stria 2 11
3 Very small species, BL = 5.7–6.1 mm; body form relatively stout, elytral lateral margins strongly expanded near middle; elytral striae distinctly punctate before middle (Fig. 25D, E); aedeagus without ridge on ventral surface, without lamellar denticle on left margin of apical lamella (Fig. 25A, B) ..... [13] *P. rongyu* sp. nov.
– Larger species, BL = 6.8–12.6 mm; body form longer, elytral lateral margins nearly parallel or slightly expanded behind middle; elytral striae at most very faintly punctate near base; aedeagus more or less ridged on ventral surface (except for *P. dentellus*), with lamellar denticle on left margin of apical lamella 4
4 Lateral sides distinctly constricted between pronotum and elytra, elytral lateral margins slightly expanded behind middle (Fig. 6E, F); inner sulcus of pronotal basal fovea closer to lateral margin than to median line, the ratio of length between two inner sulci to pronotal posterior margin = 0.53–0.65; outer sulcus usually well defined, area between outer sulcus and lateral channel more or less ridged; aedeagus with a distinct lamellar denticle strongly pointed dorsally on left margin of apical lamella 5
– Body form somewhat laterally paralleled, weakly constricted between pronotum and elytra (Fig. 18E, F); inner sulcus of pronotal basal fovea usually closer to median line than to lateral margin, the ratio of length between two inner sulci (measured at midpoint of inner sulci) to pronotal posterior margin = 0.46–0.52; outer sulcus very faintly defined, completely plain on area between outer sulcus and lateral channel; aedeagus with weakly pointed lamellar denticle on the margin of apical lamella 10
5 Pronotal disc more convex; basal foveae distinctly depressed on intersulcate area, usually with very few punctures, but exceptions also existed; male sternite VI with a small tubercle on the middle of posterior margin; females with fine linear microsculpture on elytra (Fig. 1H), similar as males ..... [1] *P. dentellus* Facchini & Sciaky
– Pronotal disc less convex; basal foveae nearly flat or slightly convex on intersulcate area, always distinctly punctate; male sternite VI not modified; females with granular microsculpture on elytra (Fig. 1I), different from males 6
6 Antennomere 3 with a few accessory setae along inner margin (Fig. 1A); apical lamella of aedeagus with lamellar base slightly shorter than lamellar denticle; Wufeng ..... [6] *P. wangshu* sp. nov.
– Antennomere 3 without accessory setae (Fig. 1B); apical lamella of aedeagus with lamellar base distinctly shorter than lamellar denticle; Shennongjia 7

7 Basal foveae with outer sulcus reduced, much shallower than and much less than half length of inner sulcus (Fig. 3D); ventral surface of median lobe with three fully developed ridges (Fig. 14C) ..... [4] *P. lisao* sp. nov.
– Basal foveae with outer sulcus well developed, slightly shallower than and at least as long as half length of inner sulcus; ventral surface of median lobe with only one or two ridges (Figs 8C, 10C, 15C)..... 8
8 Pronotum a little more strongly ridged between lateral channel and outer sulcus; lateral channels narrower, at most very faintly punctate behind middle; elytral interval 3 usually with three or four setigerous pores; ventral surface of median lobe of aedeagus with straight ridge on basal half of left margin (Fig. 10C); gonocoxite 2 of ovipositor straight, with minute ensiform setae (Fig. 5B)..... [3] *P. shennongjianus* Facchini & Sciaky
– Pronotum more shallowly ridged between lateral channel and outer sulcus; lateral channels wider, usually finely punctate along their full length; elytral interval 3 usually with two setigerous pores; ventral surface of median lobe of aedeagus with sinuate ridge (Fig. 8C) on right margin (Fig. 15C); gonocoxite 2 of ovipositor curved, with normal-sized ensiform setae (Fig. 5C, E)..... 9
9 Pronotal basal foveae usually with a few fine punctures on outer surface of the ridge between lateral channel and outer sulcus (Fig. 3B); male sternite VII with transversal wrinkles (Fig. 2B); aedeagus with lamellar denticle about two times longer than lamellar apex .....[2] *P. quyuani* sp. nov.
– Pronotal basal foveae at most with one or two fine punctures on the ridge between lateral channel and outer sulcus (Fig. 3E); male sternite VII without wrinkles (Fig. 2F); aedeagus with lamellar denticle about half length as lamellar apex..... [5] *P. lingjun* sp. nov.
10 Body size smaller, BL = 6.8–7.8 mm; fifth tarsomeres with two or three pairs of ventral setae (Fig. 1F); elytral humeral tooth sharper, apex distinctly hooked backwards (Fig. 4D); apical lamella of aedeagus short and wide in dorsal view, without tooth on right margin (Fig. 18C) .....[7] *P. hubeicus* Facchini & Sciaky
– Body size larger, BL = 7.9–10.0 mm; fifth tarsomeres without ventral seta (Fig. 1E); elytral humeral tooth thicker, apex weakly hooked backwards (Fig. 4A); apical lamella of aedeagus very slender in dorsal view, with a tooth on right margin (Fig. 20C).....[8] *P. yaotiao* sp. nov.
11 Very small species, BL = 4.6–4.7 mm; antennae moniliform, antennomere 3 with a few accessory setae along inner margin; parascutellar pore absent; the apical setigerous pore on elytral interval 3 placed anteriorly, near apical third... ..... [14] *P. chachi* sp. nov.
– Larger species, BL = 7.5–8.3 mm; antennae filiform, antennomere 3 without accessory setae; parascutellar pore present; the apical setigerous pore on elytral interval 3 placed more posteriorly, near apical fourth..... 12
12 Outer sulcus of pronotal basal fovea oblique to posterior margin of pronotum, forming an acute angle of about 75° (Fig. 4E); apical lamella of aedeagus very strongly capitate and bent upward, apex large and truncated in lateral view (Fig. 23A).....[11] *P. toledanoi* Facchini & Sciaky
– Outer sulcus of pronotal basal fovea nearly vertical to posterior margin of pronotum (Fig. 4F); apical lamella of aedeagus weakly capitate and bent upward, apex small and rounded in lateral view (Fig. 24A) .....[12] *P. xuanzhang* sp. nov.
13 Pronotal lateral margin slightly constricted basally, PBW/PW = 0.75–0.77; pronotal basal median area impunctate; outer sulcus shallow but distinct (Fig. 4B); apical lamella of aedeagus wide, length subequal to basal width (Fig. 22B) ..... [10] *P. zhizheng* sp. nov.
– Pronotal lateral margin strongly constricted basally, PBW/PW = 0.63–0.67; pronotal basal median area distinctly punctate; outer sulcus obsolete (Fig. 4C); apical lamella of aedeagus slender, distinctly longer than basal width (Fig. 21B) . .....[9] *P. lianquan* sp. nov.

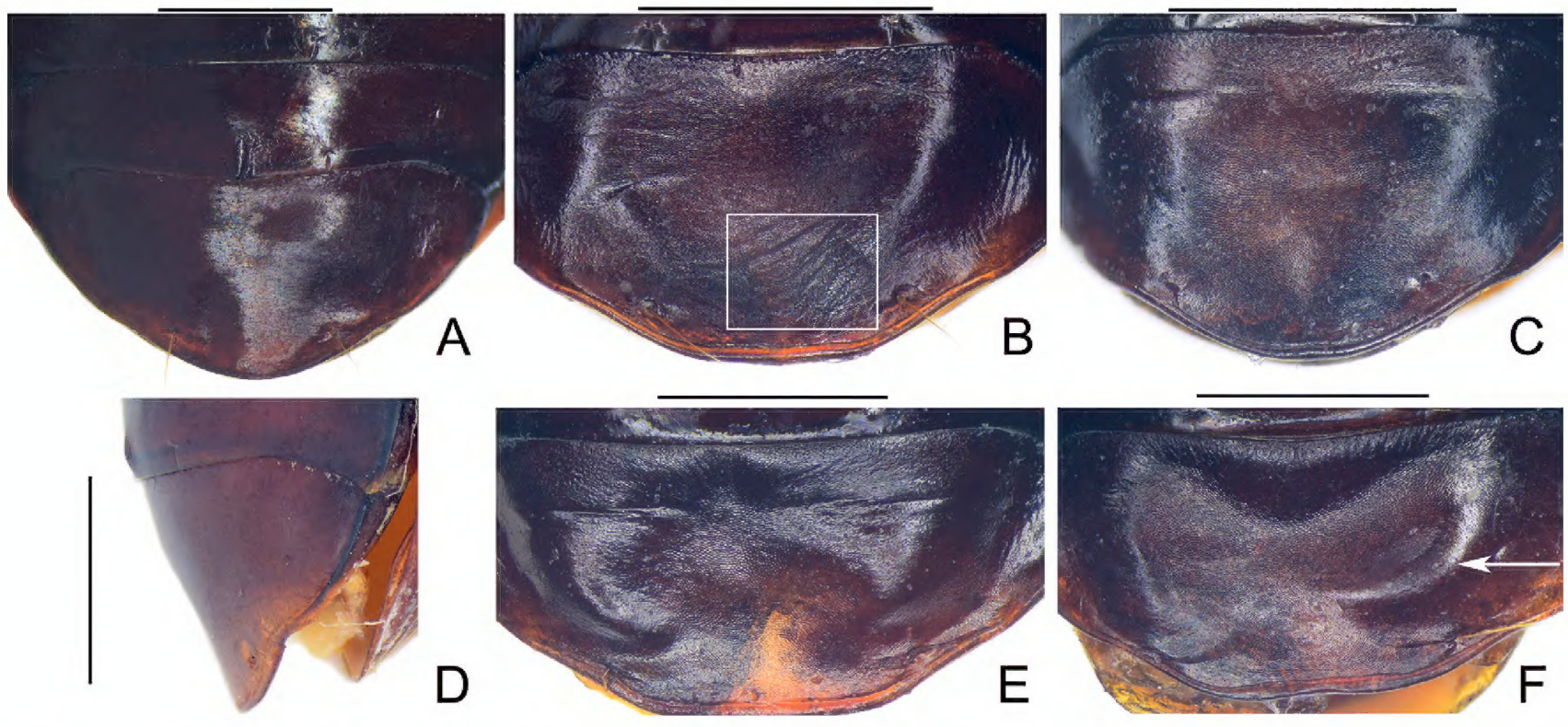

Figure 2. Male sternum of *P.* (*Morphohaptoderus*) spp. **A, D.** *P. dentellus*; **B.** *P. quyuani* sp. nov.; **C.** *P. shennongjianus*; **E.** *P. lisao* sp. nov.; **F.** *P. lingjun* sp. nov. Scale bars: 1 mm.

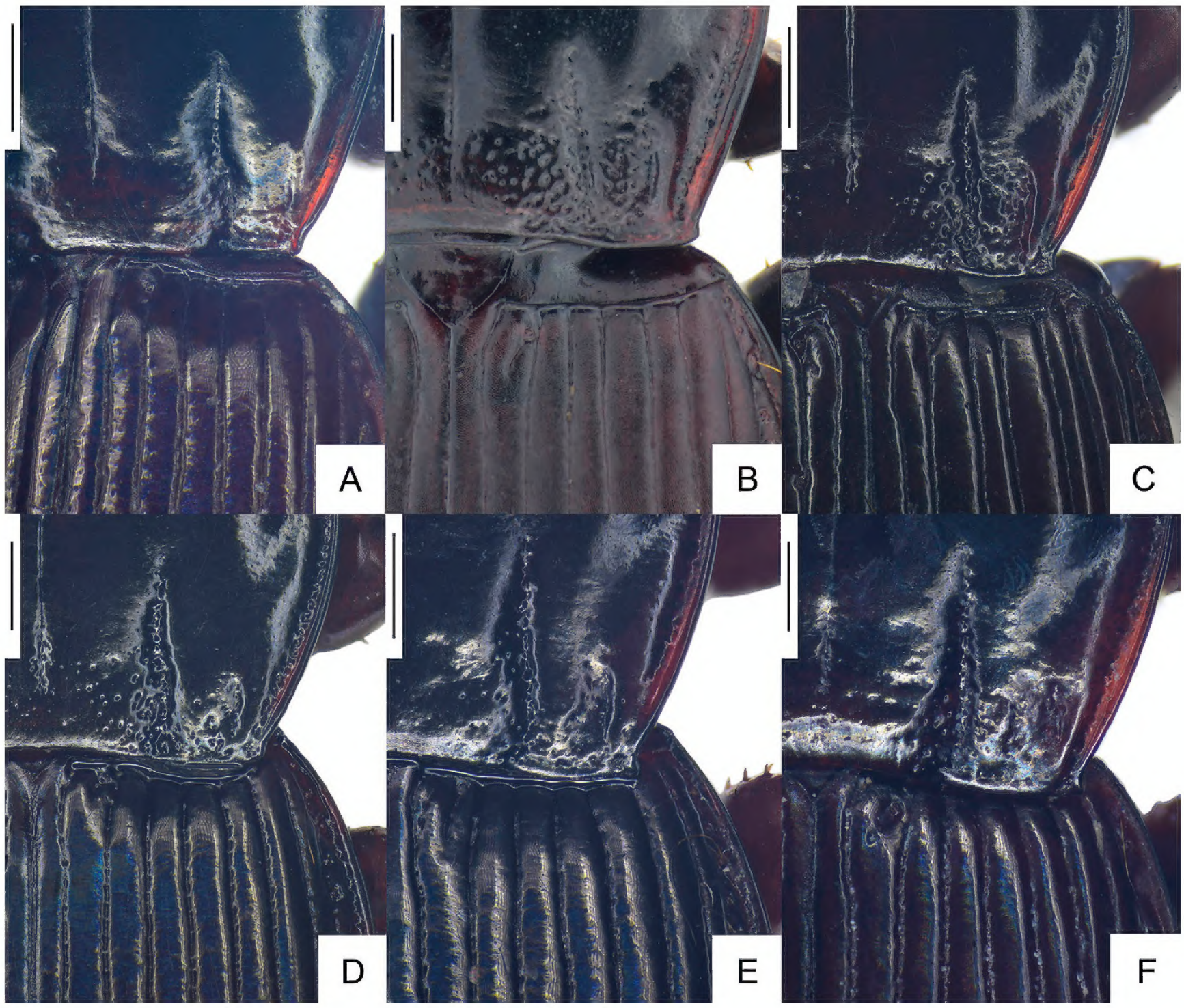

Figure 3. Pronotum posterior angle and basal area of *Pterostichus* (*Morphohaptoderus*) spp. **A.** *P. dentellus*; **B.** *P. quyuani* sp. nov.; **C.** *P. shennongjianus*; **D.** *P. lisao* sp. nov.; **E.** *P. lingjun* sp. nov.; **F.** *P. wangshu* sp. nov. Scale bars: 0.5 mm.

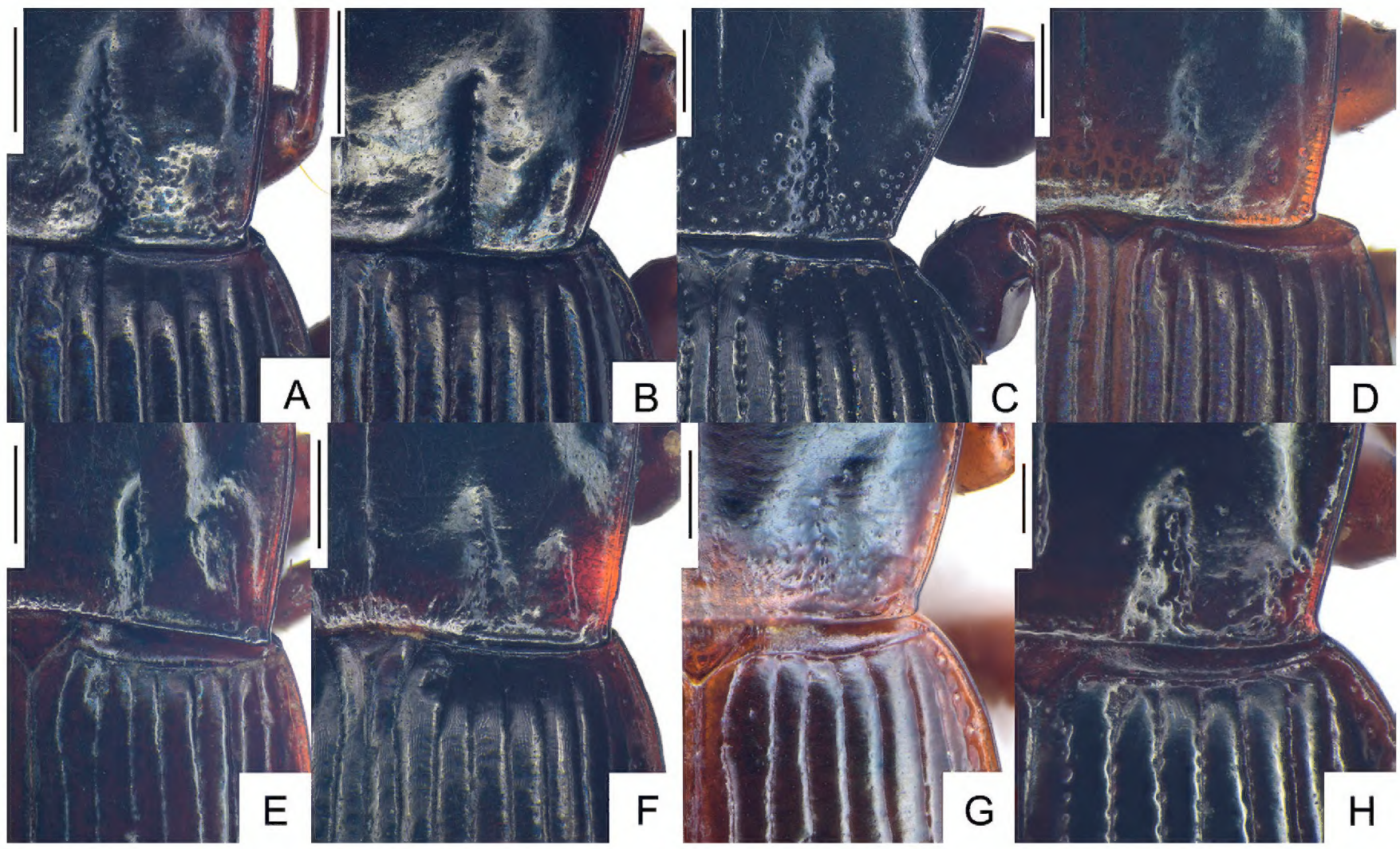

Figure 4. Pronotum posterior angle and basal area of *Pterostichus* (*Morphohaptoderus*) spp. **A.** *P. yaotiao* sp. nov.; **B.** *P. zhizheng* sp. nov.; **C.** *P. lianquan* sp. nov.; **D.** *P. hubeicus*; **E.** *P. toledanoi*; **F.** *P. xuanzhang* sp. nov.; **G.** *P. chachi* sp. nov.; **H.** *P. rongyu* sp. nov. Scale bars: 0.5 mm (**A–F**); 0.25 mm (**G–H**).

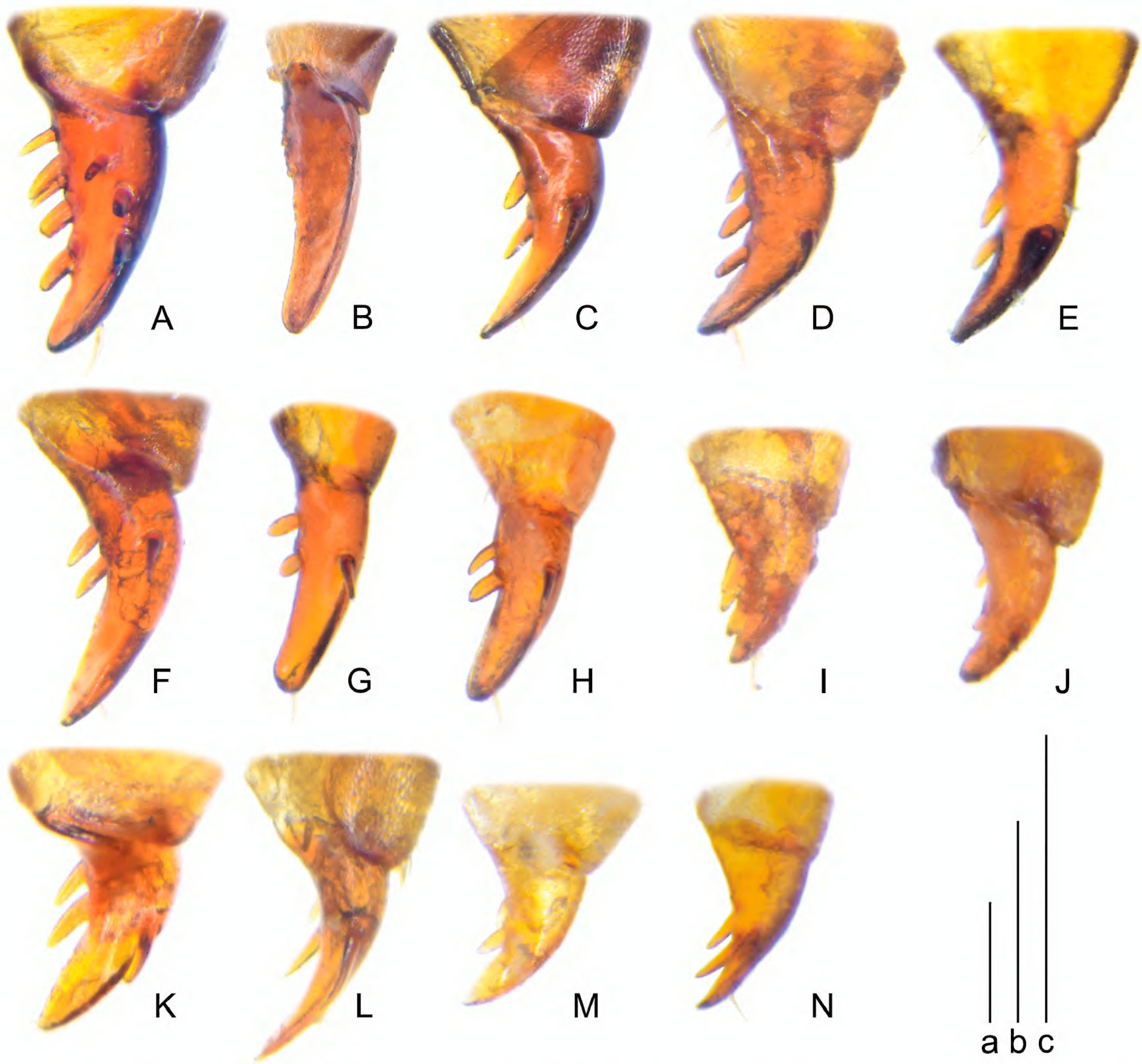

Figure 5. Gonocoxites 2 of ovipositor, dorsal view. **A.** *P. dentellus*; **B.** *P. shennongjianus*; **C.** *P. quyuani* sp. nov.; **D.** *P. lisao* sp. nov.; **E.** *P. lingjun* sp. nov.; **F.** *P. wangshu* sp. nov.; **G.** *P. toledanoi*; **H.** *P. xuanzhang* sp. nov.; **I.** *P. hubeicus*; **J.** *P. yaotiao* sp. nov.; **K.** *P. lianquan* sp. nov.; **L.** *P. zhizheng* sp. nov.; **M.** *P. chachi* sp. nov.; **N.** *P. rongyu* sp. nov. Scale bars: 0.25 mm, a for **A, B**, b for **C–H**, c for **I–N**.

[1] *Pterostichus* (*Morphohaptoderus*) *dentellus* Facchini & Sciaky, 2003

Figs 1H, 2A, D, 3A, 5A, 6, 7A, B, 12A–C

Chinese vernacular name: 齿通缘步甲

Pterostichus (*Morphohaptoderus*) *dentellus* Facchini & Sciaky, 2003: 8 (holotype in CSF; type locality: Hubei: Shennongjia).

Type examined. *Holotype*: Hubei • ♂, labeled "CHINA, W Hubei, Shennongjia Forest, reg. 2000 m 8.6.95"; "HOLOTYPE, *Pterostichus* (*Morphohaptoderus*) *dentellus* n. sp., Det. Facchini & Sciaky 2000" [red label] (CSF). ***Paratypes*: Hubei** • 1 ♂, 1 ♀, the same data as holotype but labeled as paratype (IZAS).

Non-type material examined. Hubei • 2 ♂, 1 ♀, labeled "Hubei Province, Shennongjia, Jinhouling, 2500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (CBFU); • 1 ♀, labeled "Hubei Province, Shennongjia, Hongping Town, Wenshui Village, 1700 m, pitfall trap, 2013.VIII.13, Hao Huang leg." [in Chinese] (CBFU); • 1 ♂, 3 ♀, labeled "Hubei Province, Shennongjia, Shennongding Scenic Area Entrance, 1884 m, pitfall trap, N31.5059, E110.3346, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (CBFU); • 2 ♂, 5 ♀, labeled "Hubei Province, Shennongjia, Shennongding, Jinhouling Crossroad, 2200 m, pitfall trap, N31.4755, E110.3066, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (CBFU); • 25 ♂, 26 ♀, labeled "Hubei Province, Shennongjia, Yanziya, 2300 m, pitfall trap, 2013.VIII.19, Hao Huang leg." [in Chinese] (CBFU); • 1 ♀, labeled "Hubei Province, Shennongjia Forestry District, Hongping Town, N31.4739, E110.3003, 2500 m, 2020.VIII.1–10, Jialin Tian leg., pitfall trap." [in Chinese] (CBFU); • 1 ♀, labeled "Muyu, Shennongjia, Hubei Prov.

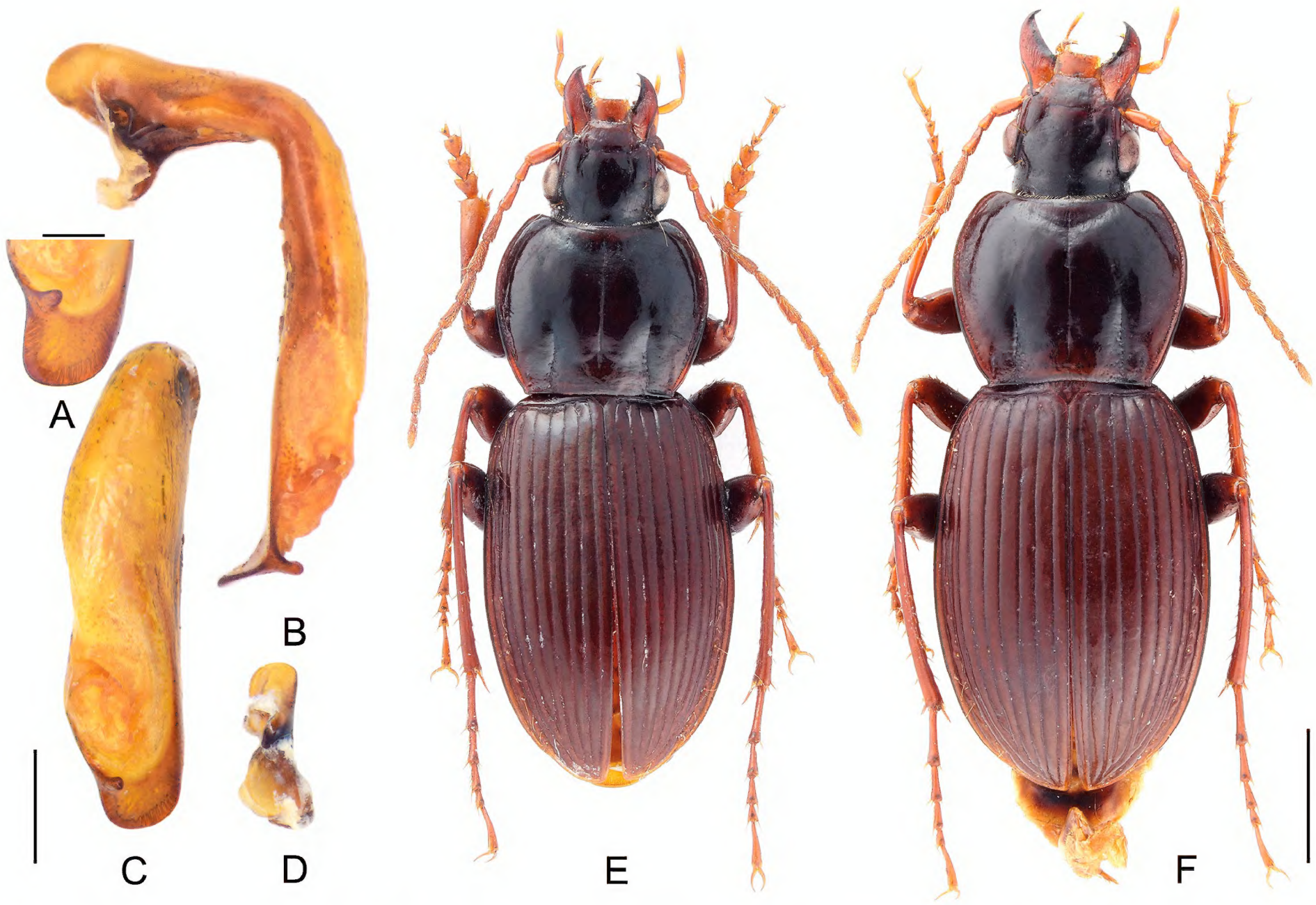

Figure 6. *Pterostichus* (*Morphohaptoderus*) *dentellus* Facchini & Sciaky, from Shennongjia, Hubei. **A.** Apical lamella, dorsal-apical view; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, dorsal view; **D.** Right paramere; **E.** Habitus, male; **F.** Habitus, female. Scale bars: 0.25 mm (**A**); 0.5 mm (**B–D**); 2.0 mm (**E, F**).

6.VIII.2002, Li & Tang leg." (IZAS); • 1 ♂, labeled "Hubei, Shennongjia, Jiuhuping, 1800–1950 m, N31.5085, E110.3485, 2025.IV.5, Yifan Wang lgt." (CBFU); • 1 ♀, labeled "China, W Hubei, 20. V. –7. VI., DASHENNONGJIA mts., 31.5N 110.3E, 2700 m, Jaroslav Turna leg., 2005" (CRS); **Chongqing** • 3 ♂, 1 ♀, labeled "Chongqing, Chengkou County, Houping Town, Longpan Village, Damaping Zhongliangzi, Xiaodong Yang leg., 2009.V.7, B06y0166 // N31°42.353′, E108°58.147′, 2152 m, broadleaf forest, daytime in Quercus dead log" [in Chinese] (CBFU); • 2 ♂, 1 ♀, labeled "Chongqing, Chengkou County, Houping Town, Longpan Village, Guangtou Mountain, Deshengping, Xiaodong Yang leg., 2009.V.8, B09-10190" [in Chinese] (CBFU); • 3 ♂, 3 ♀, labeled "Chongqing, Wuxi, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, 2024.VIII.11, Jiaheng Chen & Luyu Wang lgt." (CBFU); • 3 ♀, labeled "Chongqing, Wuxi County, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, pitfall trap, 2024.VIII.11–15, Jiaheng Chen lgt." (CBFU).

Diagnosis. Medium-large-sized species for the subgenus (BL = 9.8–10.8 mm); elytral microsculpture linear in both sexes; antennomere 3 without accessory setae; pronotum distinctly constricted to base; basal foveae without or with relatively few punctures; intersulcate area strongly depressed; elytral interval 3 always with two setigerous pores, both adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 15–17 pores (5–6, 2–3, 8–9); elytral humeral tooth small with sharp apex; fifth tarsomeres setose ventrally; male sternite VI with a small tubercle on middle of posterior margin. Median lobe of aedeagus slender, ventral surface without or with a very faint short ridge, basal portion and apical portion forming a right angle; left margin of the apical orifice with a wide triangle denticle; apical lamella short and wide, lamellar apex approximately two times length of lamellar denticle, forming angle with it. Gonocoxite 2 of female ovipositor crescent-shaped, obtuse apically, outer margin with three to five large ensiform setae, dorsal margin with two or three smaller ensiform setae, one nematiform seta located on the apical sixth of outer surface.

Comparisons. This species is externally similar to other species with distinct lamellar denticles on male genitalia (the *maximus* group), but easily distinguishable within this species group. The males can be readily distinguished from other similar species from Hubei by the unique sexual character on sternite VI (Fig. 2A, D) and females by elytra with linear microsculpture (Fig. 6F).

Compared with related species from other provinces, *P. dentellus* is most similar to *P. chungkingi* Jedlička, 1932 and *P. guizhouensis* Sciaky, 1997 for the females without granular microsculpture, pronotum distinctly constricted to base and antennomere 3 without accessory setae.

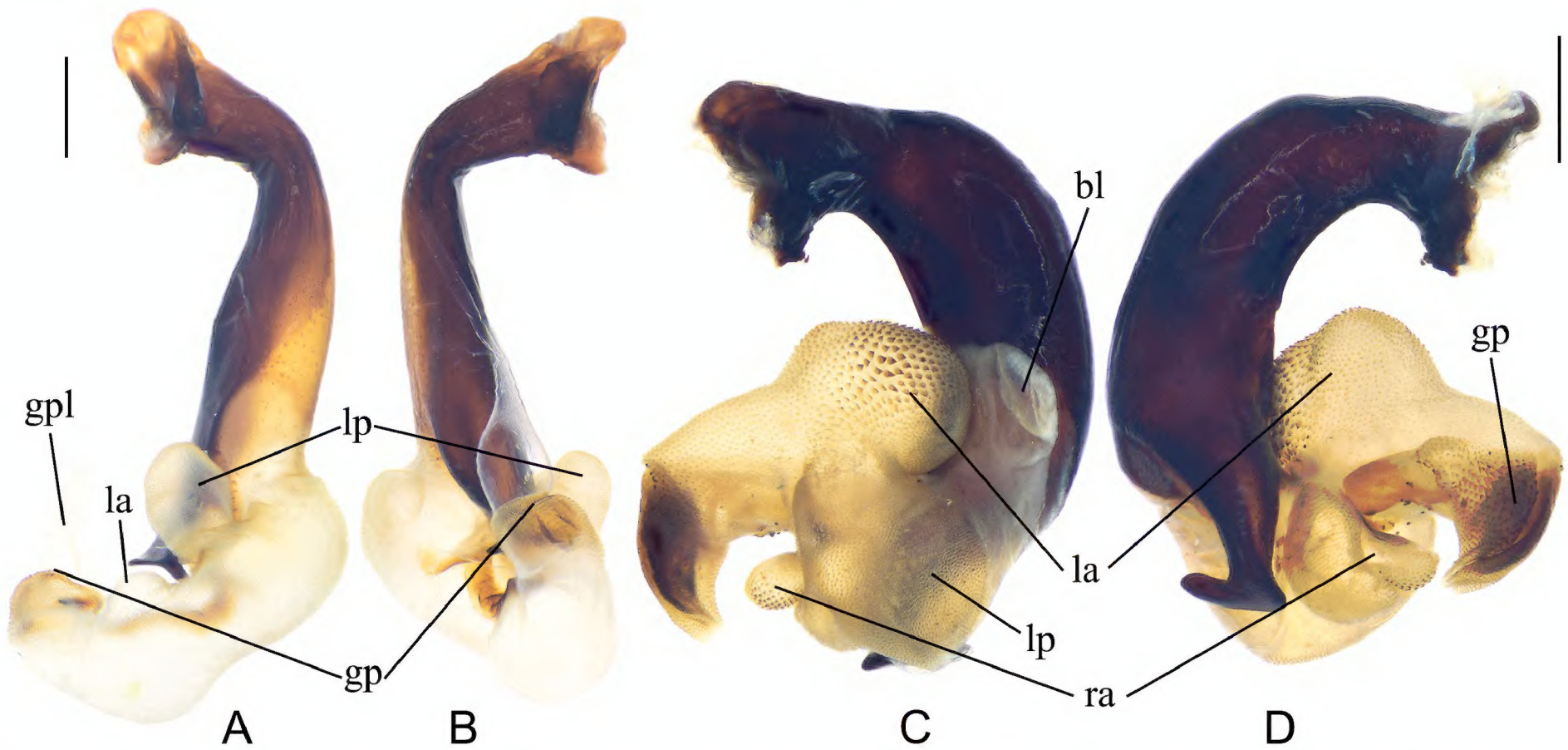

Figure 7. Endophallus of *P.* (*Morphohaptoderus*) spp. **A, B.** *P. dentellus*. **A.** Left lateral view; **B.** Right lateral view. **C, D.** *P. quyuani* sp. nov. **C.** Left lateral view; **D.** Right lateral view. Abbreviations: gp gonopore, gpl gonoporal piece, bl basal lobe, lp left pre-apical lobe, la left apical lobe, ra right apical lobe. Scale bars: 0.5 mm.

But it can be recognized from these species by the pronotum narrower and less punctate on basal fovea; median lobe of male genitalia much slenderer with larger apical lamella (Fig. 12A–C); and the gonocoxite 2 of ovipositor with three or more ensiform setae on outer margin (Fig. 5A).

Description. This species is easily recognizable and has been sufficiently described by Facchini and Sciaky (2003). A redescription is unnecessary here, except for the following supplementary descriptions on the endophallus (Fig. 7A, B): Endophallus helicon-shaped, extending to the apical direction of aedeagus, major parts of endophallus located on dorsal-left side of aedeagus; gonopore opened to lateral-basal direction of aedeagus; surface with fine scales, densest near gonopore; gonoporal piece small. Ventral side of endophallus compressed and pigmented, with a chitinized piece. Two distinct lobes recognized: left pre-apical lobe (lp) relatively large and rounded, close to base of apical lamella, decorated with fine scales, visible in both lateral views; left apical lobe (la) small and rounded, just before gonopore and close to apex of apical lamella, decorated with very fine scales.

Distribution. This species is known from three distant localities: Shennongjia in Hubei and Chengkou and Wuxi in Chongqing, all distributed at relatively high altitudes of 1700–2500 m.

[2] *Pterostichus* (*Morphohaptoderus*) *quyuani* sp. nov.

https://zoobank.org/E1F16262-9B0A-4E43-AE0A-A7312C59B7D2

Figs 2B, 3B, 5C, 7C, D, 8, 12F–I

Chinese vernacular name: 屈原通缘步甲

Type materials. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Shennongjia, Hongping Town, Wenshui Village, 1700 m, pitfall trap, 2013.VIII.13, Hao Huang leg." [in Chinese] (IZAS). ***Paratypes*** (a total of 32 ♂ and 67 ♀)**: Hubei** • 15 ♂, 28 ♀, the same data as holotype (IZAS); • 1 ♂, 3 ♀, labeled "Hubei Province, Shennongjia, near the entrance of Shennongding Scenic Area, 1884 m, pitfall trap, N31.5059, E110.3346, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (IZAS); • 1 ♀, labeled "Hubei Province, Shennongjia, Jinhouling, 2500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (CBFU); • 2 ♂, 7 ♀, labeled "Hubei Province, Shennongjia, Shennongding, Jinhouling Crossroad, 2200 m, pitfall trap, N31.4755, E110.3066, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (IZAS); • 12 ♂, 16 ♀, labeled "Hubei Province, Shennongjia, Yanziya, 2300 m, pitfall trap, 2013.VIII.19, Hao Huang leg." [in Chinese] (CBFU); • 1 ♂, 1 ♀, labeled "Hubei Province, Shennongjia Forestry District, Hongping Town, N31.4739, E110.3003, 2500 m, 2020.VIII.1–10, Jialin Tian leg., pitfall trap." [in Chinese] (CBFU); • 1 ♂, labeled "Hubei, Shennongjia, Shennongding, 3090 m, pitfall trap, 2013.VIII.21, Hao Huang leg." [in Chinese] (CBFU); • 1 ♀, labeled "China, W Hubei, 16. V. –14. VI., GUANMENSHAN 1500 m, pitfall traps, 31.45N 110.4E, Jaroslav Turna leg., 2004" (CRS); • 1 ♀, labeled "China, W Hubei, 23. VI. –14. VII., DASHENNONGJIA mts., 31.5N 110.3E, 2500–2900 m, Jaroslav Turna leg., 2003" (CRS); **Chongqing** • 3 ♀, labeled "Chongqing, Wuxi, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, 2024.VIII.11, Jiaheng Chen & Luyu Wang lgt." (CBFU); • 5 ♀, labeled "Chongqing, Wuxi County, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, pitfall trap, 2024.VIII.11–15, Jiaheng Chen lgt." (CBFU); • 1 ♀, labeled "Chongqing, Wuxi County, Yintiaoling Nature Reserve, Jieguping, 1620 m, N31.48512, E109.90803 // meadow hardwoods forest, pitfall trap, 2024.VIII.14–15, Jiaheng Chen & Yihang Li lgt." (CBFU).

Diagnosis. Medium- to large-sized species for the subgenus (BL = 9.3–11.3 mm); elytral microsculpture linear in males, granular in females; antennomere 3 without accessory seta; pronotum relatively wide and slightly narrowed to base; pronotal basal foveae densely punctate; area between lateral channel and outer sulcus shallowly ridged, usually with a few fine punctures; lateral channels finely punctate along their full length; elytral interval 3 usually with two, sometimes three, setigerous pores, all adjacent to stria 2; fifth tarsomeres setose ventrally; male sternite VII asymmetrically depressed, with distinct oblique wrinkles. Median lobe of aedeagus with a sinuate ventral ridge; lamellar denticle large, nearly twice length of lamellar apex. Gonocoxite 2 of ovipositor crescent-shaped, dorsal margin ridged on apical half, outer margin with two or three ensiform setae of normal size.

Comparison. The new species, *P. quyuani* sp. nov., is externally very similar to *P. shennongjianus* Facchini & Sciaky. These two species are sympatric and have often been confused with each other. Generally, they present the following differences in external characters: (1) In *P. quyuani* sp. nov., the region between the pronotal lateral channel and the outer sulcus of the basal fovea is typically less convex, forming a shallower ridge (Fig. 3B). The outer surface of this ridge usually has a few fine punctures; in contrast, in *P. shennongjianus* this area is usually more convex, forming a more prominent ridge, and the surface of the ridge is usually impunctate (Fig. 3C). (2) In *P. quyuani* sp. nov., the pronotal lateral channels are usually wider and finely punctate along their entire length. Conversely, in *P. shennongjianus*, the lateral channels are slightly narrower and at most punctate only behind the middle. (3) In *P. quyuani* sp. nov., elytral interval 3 usually has two setigerous pores, whereas, in *P. shennongjianus*, it usually has three or four pores.

However, the external characters mentioned above can sometimes vary individually. In fact, it is extremely difficult to distinguish these two species (as well as the other two new species described herein, *P. lisao* sp. nov. and *P. lingjun* sp. nov.) based only on external features. Nevertheless, they can be reliably differentiated by the stable characteristics of male sternite VII, male genitalia, and gonocoxite 2 of the ovipositor.

The male sternite VII of *P. quyuani* sp. nov. is shallowly depressed. There are shallow oblique wrinkles on the left side of this depression, and the apex of sternite is slightly truncated (Fig. 2B). Conversely, the male sternite VII of *P. shennongjianus* has a much fainter depression, lacks wrinkles, and the apex of sternite is more rounded (Fig. 2C). Compared to all other similar species from Hubei, the presence of wrinkles on the male sternite VII is a characteristic exclusive to *P. quyuani* sp. nov. (Fig. 2).

Regarding the male genitalia, in *P. quyuani* sp. nov., the median lobe is very stout (Fig. 8B). On its ventral surface, there is a sinuate short ridge that extends from the middle of the aedeagal base to the right margin and then terminates at the left margin (Fig. 8C). In contrast, in *P. shennongjianus*, the median lobe is more slender (Fig. 10B) and has a straight short ridge on the left margin of the ventral surface (Fig. 10C). Furthermore, when considering the apical lamella of the aedeagus, in *P. quyuani* sp. nov., the lamellar denticle is very large, being nearly twice as long as the lamellar apex (Fig. 12F–I). However, in *P. shennongjianus*, the lamellar denticle is smaller and approximately equal in length to the lamellar apex (Fig. 13F–J).

For the female ovipositor, in *P. quyuani* sp. nov., gonocoxite 2 shows the typical form of the subgenus: strongly curved, with a sharp apex, dorsal ridge absent on basal half, and ensiform setae large (Fig. 5C). But in *P. shennongjianus*, gonocoxite 2 has a distinct form: nearly straight, with an obtuse apex, dorsal ridge almost reaching base of gonocoxite 2, and ensiform setae minute (Fig. 5B).

The newly described species *P. quyuani* also strongly resembles three other new species within the *maximus* group: *P. lingjun* sp. nov., *P. lisao* sp. nov., and *P. wangshu* sp. nov. Their comparison will be presented in the descriptions of those new species. When compared to species from other provinces, *P. quyuani* sp. nov. is most similar to *P. lingshanus* Sciaky & Wrase, 1997 from Shaanxi province, since both share characteristics such as the granular microsculpture in females, antennomeres 3 without accessory setae, and the pronotum not strongly constricted towards the base. However, *P. lingshanus* differs from the present new species in several ways: size generally smaller, male sternite VII not wrinkled, and lamellar denticle of the male genitalia much smaller, shorter than the lamellar apex when in lateral view. Regarding the depressed and wrinkled male sternite VII, the present species may also be related to *P. maximus* Tschitschérine, 1889, from Gansu, and *P. dundai* Sciaky, 1994, from Shaanxi. Nevertheless, compared to *P. quyuani* sp. nov., *P. maximus* is easily distinguishable by its elytral striae distinctly punctate and the male sternite VII more strongly wrinkled. *P. dundai*, on the other hand, differs in its pronotum more constricted towards base, male sternite VII depressed but not wrinkled, and the apex of the right paramere of male genitalia strongly elongated.

Description. BL = 9.3–11.3 mm, BW = 3.7–4.5 mm; dorsal surface dark brown to black, appendages brown; elytral microsculpture linear in males, granular in females (Fig. 8F, G).

Head slightly thickened, HW/PW = 0.54–0.57; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal fifth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum rounded-rectangular, wider than length, PW/PL = 1.32–1.45, widest near middle, PBW/PW = 0.75–0.79. Anterior margin concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.73–0.83; anterior angles broadly rounded, weakly projecting; lateral margins evenly arched, gently narrowed toward base, without sinuation before posterior angles, posterior angles right-angled, usually with a faint denticle weakly projecting out. Basal foveae (Fig. 3B) densely

Figure 8. *Pterostichus* (*Morphohaptoderus*) *quyuani* sp. nov. (**A–F.** Holotype; **G.** Paratype, Wenshui Village, Shennongjia, Hubei). **A.** Apical lamella, dorsal-apical view; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, ventral view; **D.** Median lobe of aedeagus, dorsal view; **E.** Right paramere; **F.** Habitus, male; **G.** Habitus, female. Scale bars: 0.25 mm (**A**); 0.5 mm (**B–E**); 2.0 mm (**F, G**).

punctate along inner and outer sulci, as well as on intersulcate area; inner and outer sulci both with well-defined boundaries; inner sulcus straight and oblique, outer sulcus shallower, about half length of inner one; intersulcate area slightly convex; lateral channels relatively wide, with fine but distinct punctures along their full length; area between lateral channel and outer sulcus shallowly ridged, usually with a few fine punctures. Pronotal disc sometimes with very faint transverse wrinkles aside median line; median line shallow; basal median area with dense punctures.

Elytra broad and flat, lateral sides slightly expanded behind middle, BW/EL = 0.68–0.74. Elytral basal border slightly curved near middle, usually slightly curved anteriorly near shoulder, forming an obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; stria without puncture; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 usually short with free apex. Parascutellar pore present; elytral interval 3 usually with two setigerous pores, sometimes with three, on one or both sides (among the examined 98 specimens, eight showed three pores on one elytron and six showed three pores on both elytra), all pores adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 16–18 pores (6–7, 2–3, 8–9).

Fifth tarsomeres with 3–5 (usually 4) pairs of setae ventrally.

Male sternite VI not modified; sternite VII asymmetrically depressed at middle, middle depression large and shallow, with oblique wrinkles on the posterior portion of the left side of the abdomen in dorsal view; with strong isodiametric microsculpture on center of the depression, gradually turned to shallower and transverse microsculpture to lateral and anterior regions; apex of sternite slightly truncated (Fig. 2B).

Median lobe of aedeagus (Fig. 8B) stout; in lateral view, ventral margin evenly curved at middle portion, nearly straight before apical lamella and then slightly bent ventrally; apical orifice opened to left-dorsal surface of aedeagus. Ventral surface with a strong sinuate ridge before apical orifice (Fig. 8C): right ridge absent; median ridge absent; left ridge sharp, strongly sinuate near base, extended from middle part of aedeagal base to right margin, and then bent to the left, ending at left margin of the base of apical orifice. Apical lamella large and thick (Fig. 8A), rounded in dorsal view, apex widely rounded; with very large lamellar denticle near base of left margin; in lateral view, lamellar base and apex both short, lamellar denticle large, nearly twice length of lamellar apex (laL/ldL = 0.59–0.61), collinear with lamellar apex. Right paramere short, apex rounded (Fig. 8E).

Endophallus (Fig. 7C, D) bent to ventral side across left margin of aedeagus, major parts of endophallus located on ventral side of aedeagus; gonopore opened to ventral-apical direction of aedeagus; surface with coarse scales on expanded lobes, densest near gonopore; gonoporal piece large, falciform. Four distinct lobes recognized: basal lobe (bl) small, located near base of apical orifice,

membranous without decoration; left pre-apical lobe (lp) very large, located in left surface near apical lamella, decorated with fine scales, visible in the right lateral view; left apical lobe (la) large and rounded, adjacent to basal lobe, with coarse scales on apex, visible in both lateral views; right apical lobe (ra) rounded, apex with digitiform protuberance, visible in the left lateral view, apex of the protuberance scaled.

Gonocoxite 2 of female ovipositor crescent-shaped (Fig. 5C), sharply pointed apically; outer margin with two or three ensiform setae of normal size, length of the largest ensiform seta ca. 0.07 mm, dorsal margin with one or two ensiform setae before middle, strongly ridged from the distal ensiform seta to apex of gonocoxite 2, one nematiform seta located on the apical fifth of outer surface.

Distribution. This species is known from two distant localities: Shennongjia in Hubei and Wuxi in Chongqing. Most specimens were collected at a middle-high altitude ranging from 1600 m to 2300 m (only one specimen was collected at 3090 m and two specimens were collected at 2500 m). This species is the most common species of subgenus *Morphohaptoderus* in Shennongjia.

Etymology. The new species is named after Qu Yuan (屈原), a renowned poet and statesman in ancient China who lived in the State of Chu (centered around today's Hubei Province) during the Warring States Period. His works, like "Li Sao," shaped Chu Ci (also known as Songs of Chu, a significant genre in ancient Chinese literature). To commemorate Qu Yuan and promote the culture of Chu, the scientific names of all new species discovered in Hubei Province hereinafter are derived from Qu Yuan's poems. The specific epithet is a genitive noun.

Remarks. We examined one paratype of *P. shennongjianus* (Fig. 9B, C). Based on the punctures lateral to the outer sulcus of the pronotal basal fovea and the shape of the male genitalia, this specimen is identical to the present new species but differs from the holotype of *P. shennongjianus* (habitus Fig. 9A; male genitalia illustrated in Facchini and Sciaky 2003: 12).

[3] *Pterostichus* (*Morphohaptoderus*) *shennongjianus* Facchini & Sciaky, 2003

Figs 1I, 1G, 2C, 3C, 5B, 9, 10, 11A, B, 13F–J

Chinese vernacular name: 神农通缘步甲

Pterostichus (*Morphohaptoderus*) *shennongjianus* Facchini & Sciaky, 2003: 10, (holotype in CSF; type locality: Hubei: Shennongjia).

Type examined. ***Holotype*: Hubei** • ♂, labeled "CHINA, W Hubei, Shennongjia Forest, reg. 2000 m 8.6.95 // HOLOTYPE, *Pterostichus* (*Morphohaptoderus*) *shennongjianus* n. sp., Det. Facchini & Sciaky 2000" [red label] (CSF).

Non-type material examined. Hubei • 4 ♂, 3 ♀, labeled "Hubei Province, Shennongjia, Shennongding Scenic Area Entrance, 1884 m, pitfall trap, N31.5059, E110.3346, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (IZAS); • 4 ♂, 8 ♀, labeled "Hubei Province, Shennongjia, Jinhouling, 2500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (IZAS); • 2 ♂, labeled "Hubei Province, Shennongjia, Hongping Town, Yixiantian, 1500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (CBFU); • 1 ♀, labeled "Hubei Province, Shennongjia, Hongping Town, Wenshui Village, 1700 m, pitfall trap, 2013.VIII.13, Hao Huang leg." [in Chinese] (CBFU); • 1 ♂, 2 ♀, labeled "Hubei Province, Shennongjia, Shennongding, Jinhouling Crossroad, 2200 m, pitfall trap, N31.4755, E110.3066, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (CBFU); • 1 ♂, labeled "Hubei Province, Shennongjia, Yanziya, 2300 m, pitfall trap, 2013.VIII.19, Hao Huang leg." [in Chinese] (CBFU); • 3 ♂, 1 ♀, labeled "Hubei Province, Shennongjia Forestry District, Hongping Town, N31.4739, E110.3003, 2500 m, 2020.VIII.1–10, Jialin Tian leg., pitfall trap" [in Chinese] (CBFU); • 1 ♂, labeled "Hubei, Shennongjia, Badongya, 2700 m, 1980.VII.23, Peiyu Yu leg." [in Chinese] (IZAS); • 1 ♂, labeled "Xiaolongtan, Shennongjia, Hubei prov. 5.VIII.2002, Li & Tang leg." (IZAS); • 3 ♂, 1 ♀, labeled "China, W Hubei, 20. V. –7. VI., DASHENNONGJIA mts., 31.5N 110.3E, 2700 m, Jaroslav Turna leg., 2005" (CRS); • 2 ♂, labeled "China, W Hubei, 21. VI. –13. VII., GUANMENSHAN 1500 m, pitfall traps, 31.45N 110.4E, Jaroslav Turna leg., 2003" (CRS); **Sichuan** • 1 ♂, labeled "Sichuan, Wushan, Liziping, 1850 m, 1994.V.18, Wenzhu Li leg." [in Chinese] (IZAS); • 1 ♂, labeled "Sichuan, Bazhong, Nanjiang, Guangwushan Town, Micang Mountain, Rhododendron Sea of Clouds Scenic Spot // N32.7135, E106.9912, 2183 m, 2024.VI.26–28, Yuzhou Huang lgt." (CBFU); **Chongqing** • 1 ♂, labeled "Chongqing, Chengkou County, Houping, Longpan Village, Guangtou Mountain, Deshengping, Xiaodong Yang leg., 2009.V.8 B09–10190" [in Chinese] (IZAS); • 1 ♀, labeled "Chongqing, Wuxi, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, 2024.VIII.11, Jiaheng Chen & Luyu Wang lgt." (CBFU); • 1 ♂, labeled "Chongqing, Wuxi County, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, pitfall trap, 2024.VIII.11–15, Jiaheng Chen lgt." (CBFU); • 2 ♀, labeled "Chongqing, Wuxi County, Yintiaoling Nature Reserve, Jieguping, 1620 m, N31.48512, E109.90803 // meadow hardwoods forest, pitfall trap, 2024.VIII.14–15, Jiaheng Chen & Yihang Li lgt." (CBFU); • 6 ♂, 2 ♀, labeled "Chongqing, Yintiaoling, Zhuanping Guard Station to main peak, 2021 m–2200 m, N31.49925, E109.94965 // mixed forest, pitfall trap, 2024.VIII.14–15, Jiaheng Chen & Yihang Li lgt." (CBFU); • 4 ♀, labeled "Chongqing, Wuxi County, Yintiaoling, Zhuanping, Sanchahe, 1744 m, N31.495367, E109.92207 // hardwoods forest, pitfall trap, 2024.VIII.14–15, Jiaheng Chen & Yihang Li lgt." (CBFU).

Diagnosis. Medium- to large-sized species for the subgenus (BL = 8.7–12.1 mm); elytral microsculpture

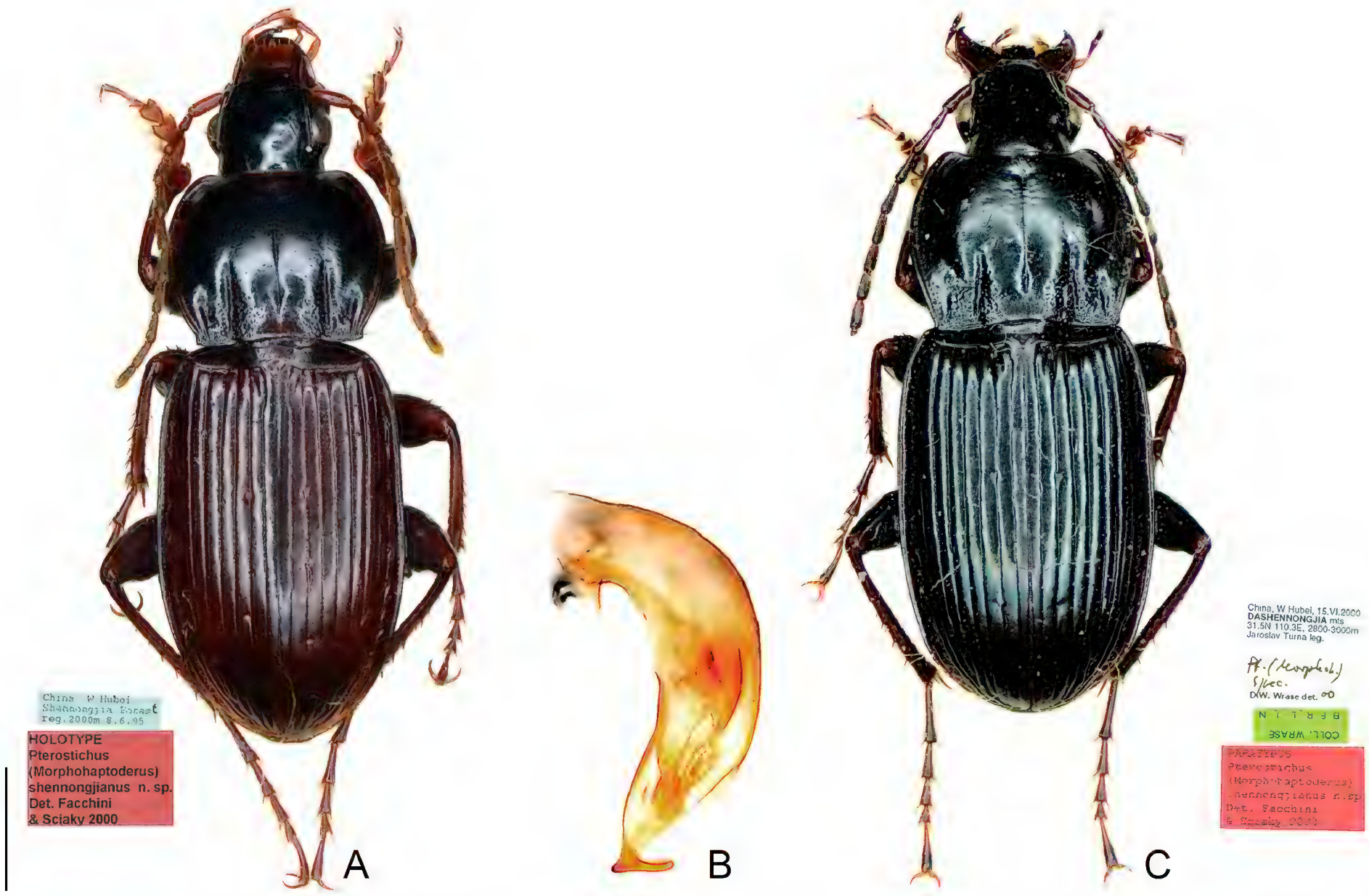

Figure 9. Habitus of *Pterostichus* (*Morphohaptoderus*) *shennongjianus* Facchini & Sciaky. **A.** Holotype; **B.** Median lobe of aedeagus, left lateral view, paratype; **C.** Paratype. Scale bars: 2 mm.

linear in males, granular in females; antennomere 3 without accessory seta; pronotum relatively wide and slightly narrowed to base; pronotal basal foveae densely punctate; area between lateral channel and outer sulcus distinctly ridged, usually without puncture; lateral channels finely punctate at most on posterior half; elytral interval 3 usually with three or more setigerous pores, all adjacent to stria 2; fifth tarsomeres setose ventrally; male sternite VII very faintly depressed, without wrinkles. Median lobe of aedeagus shortly ridged on left margin of ventral surface; lamellar denticle nearly as long as lamellar apex. Gonocoxite 2 of ovipositor straight, dorsal margin ridged except for basal fifth, outer margin with two or three minute ensiform setae.

Comparisons. There are some other sympatric species very similar to the present species. Compared with them, the following characters are exclusive to *P. shennongjianus*: elytral interval 3 usually with three or more setigerous pores; male sternite VII very faintly and symmetrically depressed (Fig. 2C); ventral surface of median lobe with a short straight ridge along left margin (Fig. 10C); gonocoxite 2 of ovipositor straight, with very minute ensiform setae on outer margin (Fig. 5B), length of the largest ensiform setae about 0.02 mm. Detailed comparisons have been provided under the descriptions of these related new species: *P. quyuani* sp. nov., *P. lisao* sp. nov., *P. lingjun* sp. nov., and *P. wangshu* sp. nov.

Description. BL = 8.7–14.0 mm, BW = 3.4–5.6 mm; dorsal surface dark brown to black, appendages brown; elytral microsculpture linear in males, granular in females (Fig. 10F, G).

Head slightly thickened, HW/PW = 0.58–0.60; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal sixth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum rounded-rectangular, wider than length, PW/PL = 1.30–1.48, widest usually slightly before middle, PBW/PW = 0.73–0.77. Anterior margin concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.80–0.85; anterior angles broadly rounded, weakly projecting; lateral margins evenly arched, gently narrowed toward base, without sinuation before posterior angles; posterior angles right-angled, usually with a faint denticle weakly projecting out. Basal foveae (Fig. 3C) densely punctate along inner and outer sulci, as well as on intersulcate area; inner and outer sulci both with well-defined boundaries; inner sulcus straight and a little oblique; outer sulcus shallower, about half length of inner one; intersulcate area slightly convex; lateral channels relatively narrow, without or with fine punctures at most between the mid-lateral seta and a distance from posterior angles; area between lateral margin and outer sulcus distinctly ridged, usually without puncture. Pronotal disc usually with very faint transverse wrinkles aside median line; median line shallow; basal median area with punctures, usually aggregated near inner sulcus.

Figure 10. *Pterostichus* (*Morphohaptoderus*) *shennongjianus* Facchini & Sciaky, from Shennongjia, Hubei. **A.** Apical lamella, dorsal-apical view; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, ventral view; **D.** Median lobe of aedeagus, dorsal view; **E.** Right paramere; **F.** Habitus, male; **G.** Habitus, female. Scale bars: 0.25 mm (**A**); 0.5 mm (**B–E**); 2.0 mm (**F–G**).

Elytra broad and flat, lateral sides slightly expanded behind middle, BW/EL = 0.67–0.72. elytral basal border nearly straight, usually distinctly curved anteriorly near shoulder, forming an obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae without punctures; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 usually short with free apex (Fig. 3C). Parascutellar pore present; setigerous pores on elytral interval 3 variable, usually three or four, sometimes five or occasionally two (among the examined 51 specimens, one specimen with two pores on left elytron, another one with two pores on both elytra), all pores usually adjacent to stria 2, sometimes (5 of 51 examined specimens) one middle or posterior pore may placed on the middle of interval or adjacent to stria 3, but the basal-most pore always adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 16–18 pores (5–6, 2–3, 8–9).

Fifth tarsomeres with 3–4 (usually 3) pairs of setae ventrally.

Male sternite VII very faintly depressed at middle, with strong isodiametric microsculpture on center of the depression, gradually turned to shallower and transverse microsculpture to lateral regions; apex of sternite rounded (Fig. 2C).

Median lobe of aedeagus relatively slender in compare to similar species; in lateral view, basal portion distinctly bent at basal fourth of median lobe, forming an angle of about 120° to apical portion (Fig. 10B); ventral margin nearly straight before apical lamella, apex distinctly bent ventrally; apical orifice large, strongly turned to left side. Ventral surface with one straight ridge before apical orifice (Fig. 10C): right ridge absent at base, very sharply indicated distal to midpoint of apical orifice; middle ridge at most very faintly displayed near base; left ridge straight and distinct, absent near base. Apical lamella thick and short (Fig. 10A); rounded in dorsal view, apex widely rounded, slightly twisted to left (Fig. 10D); with large lamellar denticle near base of left margin; in lateral view, lamellar base very short, lamellar denticle approximately equal to the length of lamellar apex (laL/ldL = 1.00–1.10). Right paramere short, apex rounded (Fig. 10E).

Endophallus (Fig. 11A, B) bent to ventral side across left margin of aedeagus, major parts of endophallus located on left-ventral side of aedeagus; gonopore opened to left-apical direction of aedeagus; surface with coarse scales on expanded lobes, densest near gonopore; gonoporal piece large, falciform. Four distinct lobes recognized: basal lobe (bl) small and digital, protruding towards the ventral side of aedeagus, membranous without decoration; left pre-apical lobe (lp) relatively small and digital, decorated with distinctly coarse scales near apex, visible in right lateral view; left apical lobe (la) large, on left surface of endophallus, close to bl, with a chitinized piece between it and ra, decorated with dense and coarse scales; right apical lobe (ra) ovoid, adjacent to apical lamella and lp, decorated with fine scales.

Gonocoxite 2 of ovipositor with a peculiar form: elongate and straight, slightly bent outwardly, apex obtuse;

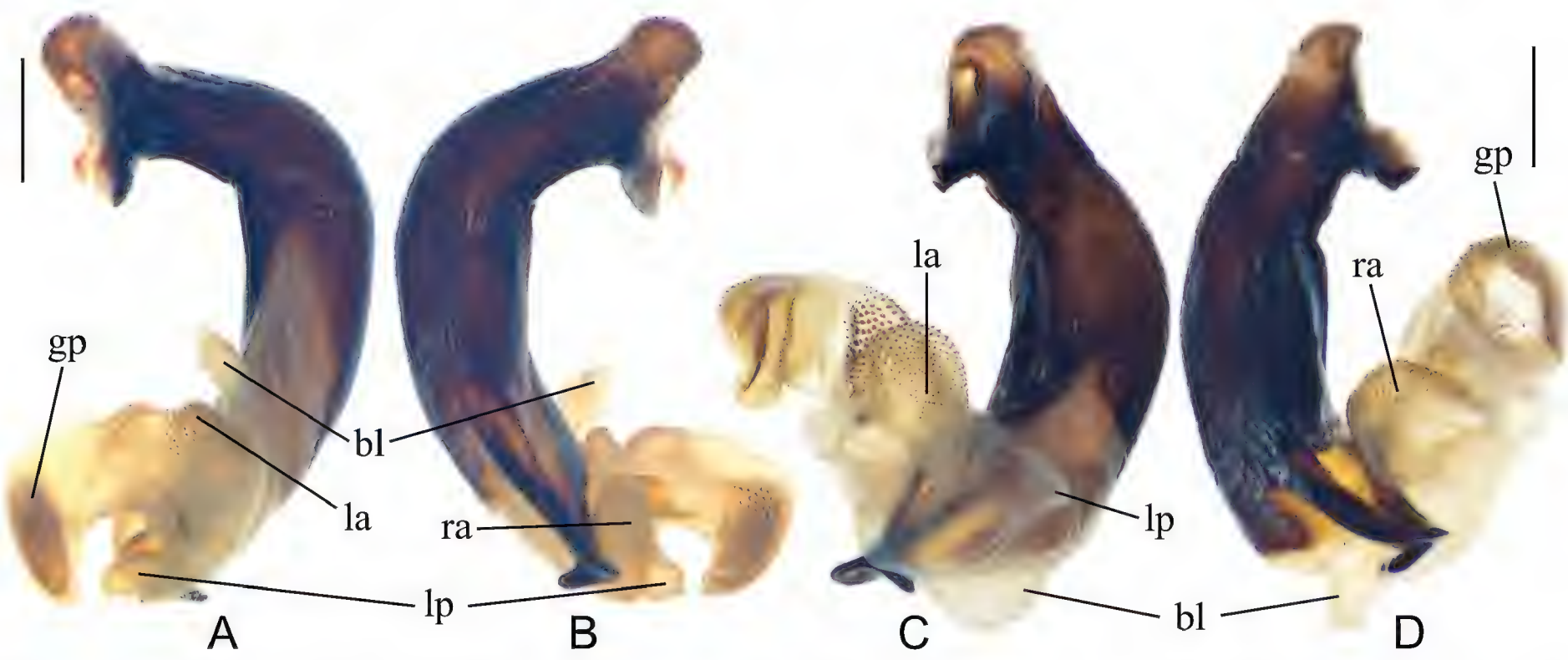

Figure 11. Endophallus of *P.* (*Morphohaptoderus*) spp. **A, B.** *P. shennongjianus*. **A.** Left lateral view; **B.** Right lateral view. **C, D.** *P. lisao* sp. nov. **C.** Left lateral view; **D.** Right lateral view. Abbreviations: gp gonopore, bl basal lobe, lp left pre-apical lobe, la left apical lobe, ra right apical lobe. Scale bars: 0.5 mm.

outer margin with two or three minute ensiform setae close to base, length of the largest ensiform seta ca. 0.02 mm; dorsal margin without or with an ensiform seta very close to base, strongly ridged except for basal fifth (Fig. 5B), one nematiform seta located on the apical eighth of outer surface.

Distribution. This species is known from three distant localities: Shennongjia of Hubei Province; Chengkou County, Wuxi County, and Wushan County of Chongqing Municipality; and Bazhong City of Sichuan Province. It inhabits mid- to high-altitude areas ranging from 1500 to 2700 m. In the original description, this species was also recorded from Zhenping County, Shaanxi Province, about 100 km northwest of Shennongjia. However, due to the occurrence of some related species that are very difficult to distinguish, this record requires verification.

[4] *Pterostichus* (*Morphohaptoderus*) *lisao* sp. nov.

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Figs 1C, 2E, 3D, 5D, 11C–D, 13A–E, 14

Chinese vernacular name: 离骚通缘步甲

Type materials. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Shennongjia, near the entrance of Shennongding Scenic Area, 1884 m, pitfall trap, N31.5059, E110.3346, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (IZAS). ***Paratypes*** (a total of 13 ♂ and 14 ♀): **Hubei** • 4 ♂, 8 ♀, the same data as holotype (IZAS & CBFU); • 2 ♂, 2 ♀, labeled "Hubei Province, Shennongjia, Hongping Town, Wenshui Village, 1700 m, pitfall trap, 2013.VIII.13, Hao Huang leg." [in Chinese] (IZAS); **Chongqing** • 2 ♂, 2 ♀, labeled "Chongqing, Wuxi, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, 2024.VIII.11, Jiaheng Chen & Luyu Wang lgt." (CBFU); • 5 ♂, 1 ♀, labeled "Chongqing, Wuxi County, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, pitfall trap, 2024.VIII.11–15, Jiaheng Chen lgt." (CBFU); • 1 ♀, labeled "Chongqing, Wuxi County, Yintiaoling Nature Reserve, Jieguping, 1620 m, N31.48512, E109.90803 // meadow hardwoods forest, pitfall trap, 2024.VIII.14–15, Jiaheng Chen & Yihang Li lgt." (CBFU).

Diagnosis. Medium- to large-sized species for the subgenus (BL = 9.6–11.5 mm); elytral microsculpture linear in males, granular in females; antennomere 3 without accessory seta; pronotal basal foveae densely punctate; area between lateral channel and outer sulcus shallowly ridged, usually with a few fine punctures; the outer sulcus very short, less than one-third length of the inner one, basally not reaching posterior margin of pronotum; elytral interval 3 usually with two setigerous pores, all adjacent to stria 2; male sternite VII nearly symmetrically depressed, without wrinkles; male genitalia with relatively small lamellar tooth, about similar length as the lamellar apex.

Comparisons. The present new species, *P. lisao* sp. nov., can be readily distinguished from all the other species of the *maximus* group in Hubei by its unique characteristic of the pronotal basal foveae. Specifically, the outer sulcus is highly reduced, typically presenting as a large, elongated puncture (Fig. 3D). In some specimens, although the outer sulcus is somewhat more developed, its apex can extend to near the midpoint of the inner sulcus, and its base is clearly separated from the basal margin of the pronotum. As a result, the length of the outer sulcus is less than one-third of the inner sulcus. And for all other similar species from Hubei, the outer sulcus is nearly reaching basal margin of pronotum and about half length of the inner sulcus.

In Shennongjia of Hubei Province, *P. lisao* sp. nov. is sympatric with and similar to three other species: *P. quyuani* sp. nov., *P. shennongjianus*, and *P. lingjun* sp. nov. Besides the distinct morphology of the

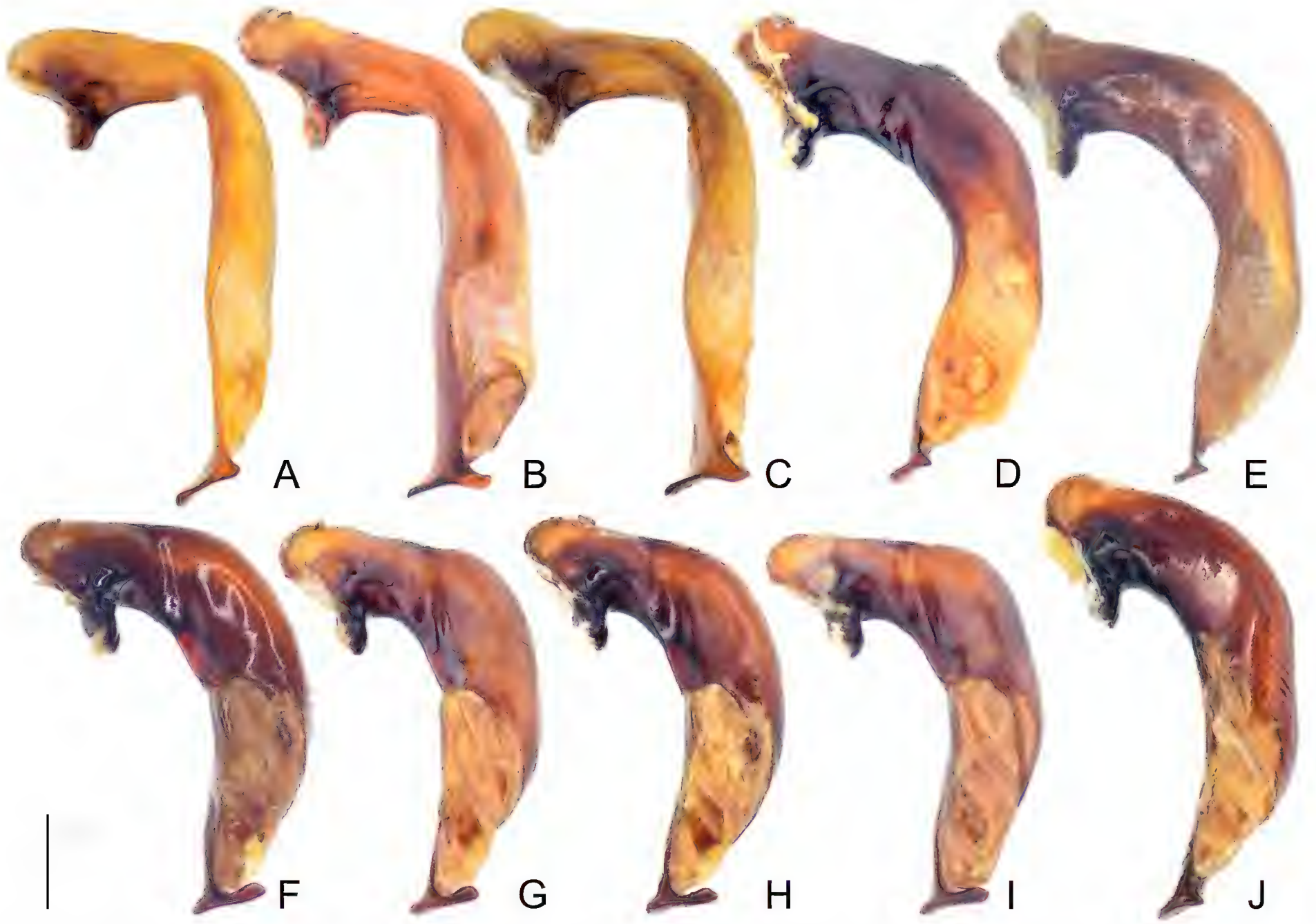

Figure 12. Median lobe of aedeagus, left lateral view. **A–C.** *P. dentellus*; **D, E.** *P. wangshu* sp. nov.; **F–I.** *P. quyuani* sp. nov.; **J.** *P. lingjun* sp. nov. **A.** Non-type specimen, Shennongjia, Yanziya, 2300 m; **B.** Non-type specimen, Shennongjia, Jiuhuping, 1800–1950 m; **C.** Non-type specimen, Yintiaoling, Shizhuzi, 2137 m; **D.** Paratype, Wufeng, Houhe Nature Reserve, 900–1000 m; **E.** Holotype, Wufeng, Houhe Nature Reserve, 900–1000 m; **F.** Holotype, Shennongjia, Wenshui Village, 1700 m; **G–I.** Paratype, Shennongjia, Wenshui Village, 1700 m; **J.** Holotype, Shennongjia, Guanmen Mountain, 1361 m. Scale bars: 0.5 mm.

pronotal basal foveae, *P. lisao* sp. nov. is also different from *P. quyuani* sp. nov. in that posterior angels of pronotum usually more faintly denticulate; male sternite VII without wrinkles; aedeagus with three ridges on the ventral surface (Fig. 14C), lamellar denticle of aedeagus much smaller, not collinear with the lamellar apex (Fig. 13A–E).

Compared with *P. shennongjianus*, *P. lisao* sp. nov. is different in the elytral interval 3 with only two setigerous pores; the area between outer sulcus of pronotal basal fovea and the lateral channel less convex; lateral channel slightly wider (Fig. 3D); the depression on male sternite VII deeper (Fig. 2E); aedeagus stouter, with three ridges on the ventral surface (Fig. 14C), lamellar denticle not collinear with lamellar apex; gonocoxite 2 of ovipositor with normal-sized ensiform setae (Fig. 5D). The comparisons with *P. lingjun* sp. nov. will be provided under the description of that species.

Description. BL = 8.9–11.5 mm, BW = 3.5–4.5 mm; dorsal surface dark brown to black, appendages brown; elytral microsculpture linear in males, granular in females (Fig. 14F, G).

Head slightly thickened, HW/PW = 0.46–0.49; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal fifth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum rounded-rectangular, wider than length, PW/PL = 1.26–1.42, widest near middle, PBW/PW = 0.69–0.74. Anterior margin concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.80–0.90; anterior angles broadly rounded, weakly projecting; lateral margins evenly arched, gently narrowed toward base, without sinuation before posterior angles; posterior angles obtuse-angled, apex with a very faint denticle hardly recognizable. Basal foveae (Fig. 3D) distinctly punctate along inner and outer sulci; intersulcate area flat or slightly convex, with sporadic punctures; inner sulcus deeper and long, with well-defined boundaries; outer sulcus reduced, much shallower and less than one-third length of inner one, basally not reaching basal margin of pronotum; lateral channels wide, with fine punctures along their full length; area between lateral margin and outer sulcus faintly ridged, usually without puncture. Pronotal disc usually with very faint transverse wrinkles aside median line; median line shallow; basal median area with punctures close to inner sulcus.

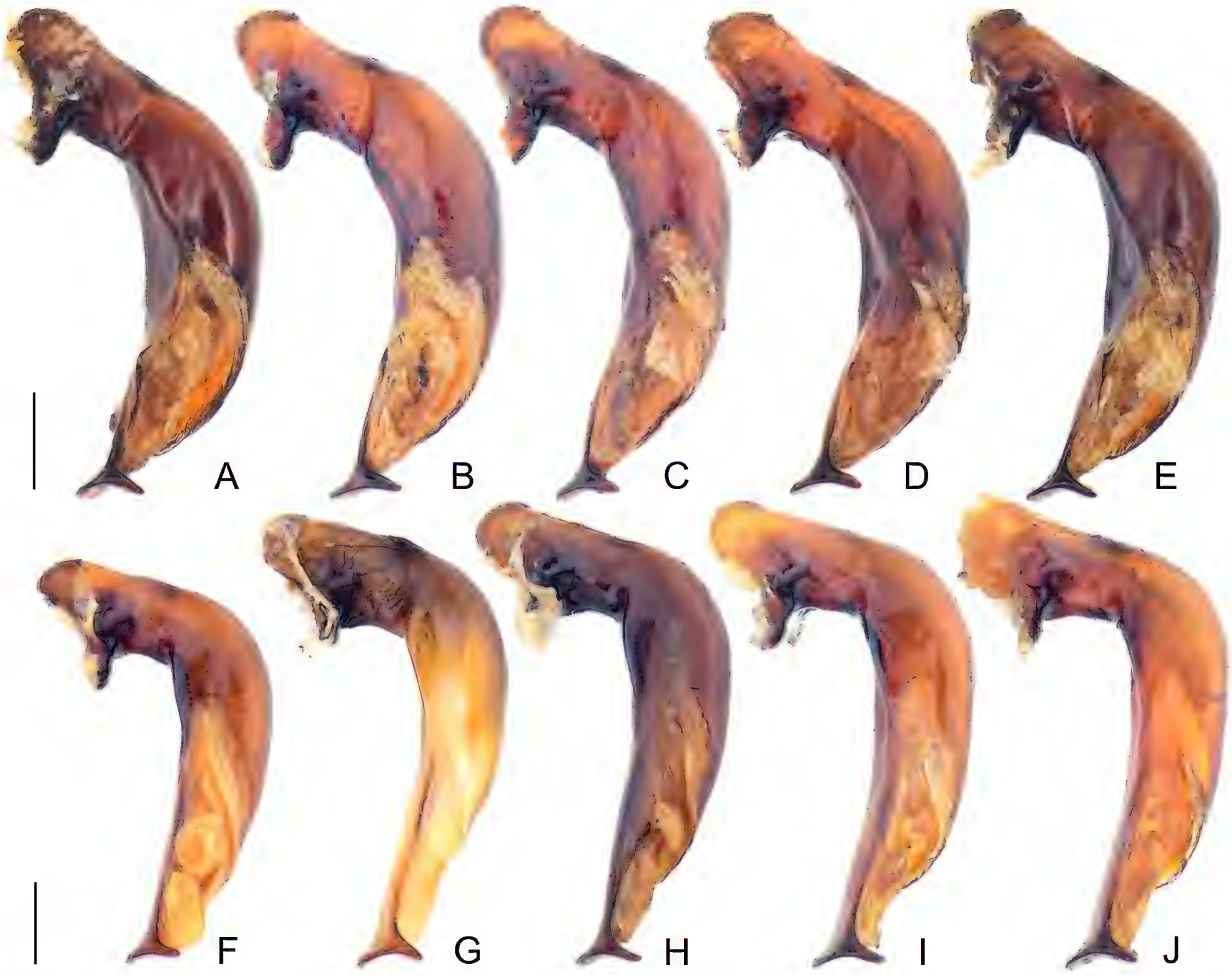

Figure 13. Median lobe of aedeagus, left lateral view. **A–E.** *P. lisao* sp. nov.; **F–J.** *P. shennongjianus*. **A.** Holotype, Shennongjia, Shennongding Scenic Area Entrance, 1884 m; **B, C.** Paratype, Yintiaoling, Shizhuzi, 2137 m; **D, E.** Paratype, Shennongjia, Shennongding Scenic Area Entrance, 1884 m; **F.** Paratype, Shennongjia, Yixiantian, 1500 m; **G.** Paratype, Shennongjia, Shennongding Scenic Area Entrance, 1884 m; **H.** Paratype, Shennongjia, Hongping Town, 2500 m; **I–J.** Paratype, Yintiaoling, Zhuanping Guard Station to main peak, 2021–2200 m. Scale bars: 0.5 mm.

Elytra broad and flat, lateral sides slightly expanded behind middle, BW/EL = 0.66–0.70. elytral basal border nearly straight, slightly curved anteriorly near shoulder, forming a distinct obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae impunctate or very faintly punctate before middle; parascutellar striole joined to apical portion of stria 1, angular base of stria usually short with free apex (Fig. 3D). Parascutellar pore present; elytral interval 3 usually with two pores, but also can be three pores (among the examined 28 specimens, four specimens with three pores on one elytron), all pores adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 16–18 pores (5–6, 2–3, 8–10).

Fifth tarsomeres with 3–4 pairs of setae ventrally.

Male sternite VII deeply shallowly but distinctly depressed at middle; central depression nearly symmetric, without wrinkles; with strong isodiametric microsculpture on center of the depression, gradually turned to shallower and transverse microsculpture to lateral regions; apex of sternite slightly truncated (Fig. 2E).

Median lobe of aedeagus (Fig. 14B) stout; in lateral view, ventral margin evenly curved before middle, nearly straight and then slightly bent ventrally before apical lamella, apical lamella abruptly bent to ventral side; apical orifice large, strongly turned to left side. Ventral surface with three ridges before apical orifice (Fig. 14C): right ridge nearly entire, sinuate near base, disappearing at a very short distance from aedeagal base; median ridge short and shallow, from basal third of median lobe to the level of midpoint of apical orifice; left ridge entire and strongly sinuate near base. Apical lamella relatively thin and short (Fig. 14A); rounded in dorsal view, apex widely rounded, slightly twisted to left, with large lamellar denticle near base of left margin; in lateral view, lamellar base short, lamellar denticle approximately equal to the length of lamellar apex (laL/ldL = 1.19–1.21), lamellar denticle forming a distinct angle (about 110°) with lamellar apex. Right paramere short, apex rounded (Fig. 14E).

Endophallus (Fig. 11C, D) bent to ventral side across left side of aedeagus, major parts of endophallus located on ventral side of aedeagus; gonopore opened to left-ventral

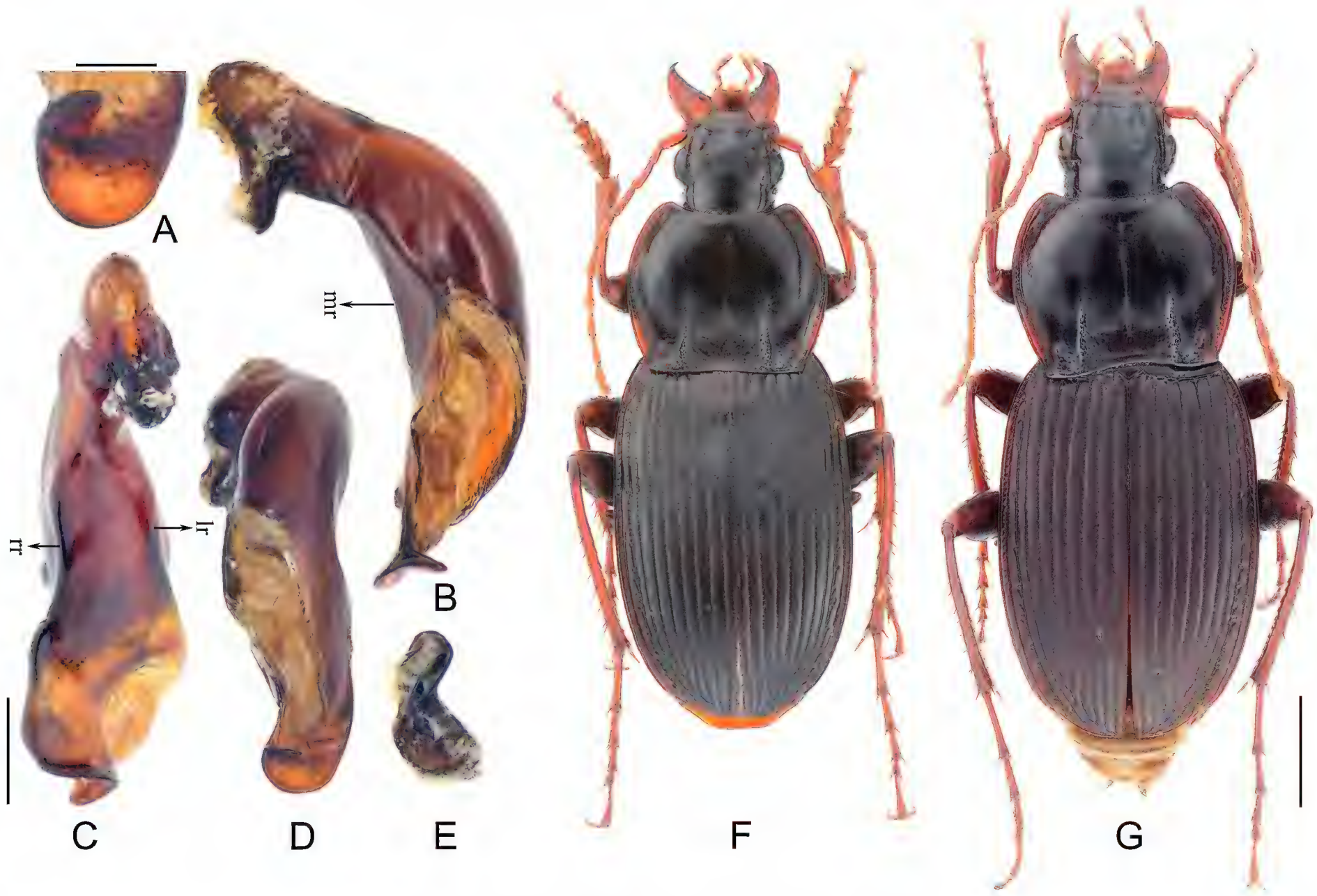

Figure 14. *Pterostichus* (*Morphohaptoderus*) *lisao* sp. nov. (**A–F.** Holotype; **G.** Paratype, Wenshui Village, Shennongjia, Hubei). **A.** Apical lamella, dorsal-apical view; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, ventral view; **D.** Median lobe of aedeagus, dorsal view; **E.** Right paramere; **F.** Habitus, male; **G.** Habitus, female. Abbreviations: rr right ridge, mr median ridge, lr left ridge. Scale bars: 0.25 mm (**A**); 0.5 mm (**B–E**); 2.0 mm (**F, G**).

direction of aedeagus; surface with coarse scales on expanded lobes, densest near gonopore; gonoporal piece falciform. Four distinct lobes recognized: basal lobe (bl) large, basal to apical lamella, membranous without decoration; left pre-apical lobe (lp) quite small, close to base of endophallus, membranous without decoration, invisible in right lateral view; left apical lobe (la) large and rounded, with scales and denser to base of lobe; right apical lobe (ra) large and rounded, located in the ventral-right side of endophallus, decorated with coarse scales.

Gonocoxite 2 of ovipositor crescent-shaped (Fig. 5D), apex sharply pointed; outer margin with two or three ensiform setae of normal size, length of the largest ensiform seta ca. 0.06 mm; dorsal margin with one ensiform seta near middle, strongly ridged from the ensiform seta to apex of gonocoxite 2, one nematiform seta located on the apical sixth of outer surface.

Distribution. This species is known from two distant localities: Shennongjia in Hubei and Wuxi in Chongqing, and is distributed at mid-altitudes of 1620–2137 m.

Etymology. The new species is named after "Li Sao," Qu Yuan's most famous representative work and a core piece in Chu Ci. This is a long, patriotic, and romantic poem, filled with rich imagination and the use of dialects. It created the "Sao style" and deeply influenced Chinese literature. The name is treated as a noun in apposition.

[5] *Pterostichus* (*Morphohaptoderus*) *lingjun* sp. nov.

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Figs 2F, 3E, 5E, 12J, 15

Chinese vernacular name: 灵均通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Shennongjia, Guanmenshan, N31.4362, E110.3824, pitfall trap, 1361 m, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (IZAS). ***Paratype*: Hubei** • 1 ♀, the same data as holotype (CBFU).

Diagnosis. Large-sized species for the subgenus (BL = 11.5–11.6 mm); elytral microsculpture linear in males, granular in females; antennomere 3 without accessory seta; pronotal basal foveae densely punctate; area between lateral channel and outer sulcus shallowly ridged, at most with one or two fine punctures; the outer sulcus about half length of the inner one; elytral interval 3 with two setigerous pores, all adjacent to stria 2; male sternite VII asymmetrically depressed, without wrinkles; male genitalia with relatively thick and short lamellar tooth, much less than the length of lamellar apex.

Comparisons. The new species, *P. lingjun* sp. nov., is external very similar to *P. quyuani* sp. nov., which was also found in Shennongjia, Hubei Province. These two species only have inconspicuous external differences which explicated as follows: (1) *P. lingjun* sp. nov. generally has

a slightly larger body size; (2) the area between lateral channel and outer sulcus usually more distinctly punctate in *P. quyuani* sp. nov. (Fig. 3E); (3) in *P. lingjun* sp. nov., the first discal pore on elytral interval 3 positioned relatively more towards the posterior. In the only two known specimens of *P. lingjun* sp. nov., the index of the first discal pore on elytral interval 3 is between 0.42 and 0.48 (derived from the ratio of the distance between elytral base and the first discal pore to EL), and this index is usually from 0.30 to 0.36 in *P. quyuani* sp. nov. However, because *P. quyuani* sp. nov. is a relatively common species, there are a few exceptional specimens in which this index approximates to that of *P. lingjun* sp. nov.

Although these two species have a striking external similarity, the characters on male sternite VII and aedeagus are distinct between them: (1) in *P. quyuani* sp. nov., the male sternite VII are distinctly wrinkled on left-posterior side (Fig. 2B), but without wrinkles in *P. lingjun* sp. nov. (Fig. 2F); (2) in the aedeagus of *P. quyuani* sp. nov., the lamellar denticle is particular large, nearly twice as long as the lamellar apex (Fig. 12F–I); in contrast, in *P. lingjun* sp. nov., the lamellar denticle is much smaller than the lamellar apex (Fig. 12J); (3) in *P. quyuani* sp. nov., the ventral surface of median lobe of aedeagus with a strong ridge that sinuate and extends to base (Fig. 8C); but in *P. lingjun* sp. nov., this ridge is much shallower, straight and disappeared before base (Fig. 15C). Although the above distinct differences exist for males, the females of these two species are very difficult to differentiate. The most reliable way to distinguish the females between these two species may merely be the altitude at which the specimens were collected. *P. lingjun* sp. nov. was only found in Guanmenshan of Shennongjia at the altitude of about 1361 m, but all specimens of *P. quyuani* sp. nov. were collected at the altitude above 1600 m.

P. lingjun sp. nov. is also similar to *P. lisao* sp. nov. for their male sternite VII depressed without wrinkles and median lobe of aedeagus relatively stout. These two species are different in the following aspects: (1) in *P. lisao* sp. nov., the outer sulcus of pronotal basal fovea strongly reduced, less than one-third length of inner one (Fig. 3D); whereas in *P. lingjun* sp. nov., the outer sulcus is normal as other species, about half length of the inner one (Fig. 3E); (2) in *P. lingjun* sp. nov., the male sternite VII more widely depressed, the depression with a branch extending to the basal-left side of the sternite (see the white arrow in Fig. 2F); but the basal-left side not depressed in *P. lisao* sp. nov. (Fig. 2E); (3) in the aedeagus of *P. lingjun* sp. nov., the lamellar denticle smaller, in lateral view much shorter than the lamellar apex (Fig. 12J); whereas in *P. lisao* sp. nov., lamellar denticle larger, about in same length of lamellar apex (Fig. 13A–E); (4) in *P. lisao* sp. nov., the lamellar denticle forming a distinct angle (about 110°) with lamellar apex, but in *P. lingjun* sp. nov., these two structures almost collinear; (5) in the median lobe of aedeagus of *P. lingjun* sp. nov., the ventral surface only with one short ridge before apical orifice (Fig. 15C), but with three ridges in *P. lisao* sp. nov.(Fig. 14C).

P. lingjun sp. nov. is also similar to *P. shennongjianus* and *P. wangshu* sp. nov., all distributed in Shennongjia. The present new species is different from *P. shennongjianus* for the elytral interval 3 with only two setigerous pores; the area between lateral channel and outer sulcus less convex; male sternite VII more distinctly depressed. And from *P. wangshu* sp. nov., the present new species is different in the antennomere 3 without accessory setae, median lobe of aedeagus stouter with thicker apical lamella.

Description. BL = 11.5–11.6 mm, BW = 4.5–4.7 mm; dorsal surface dark brown to black, appendages brown; elytral microsculpture linear in males, granular in females (Fig. 15F, G).

Head slightly thickened, HW/PW = 0.57–0.58; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal sixth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum rounded-rectangular, wider than length, PW/PL = 1.31–1.37, widest near middle, PBW/PW = 0.70–0.74. Anterior margin concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.81–0.82; anterior angles broadly rounded, weakly projecting; lateral margins evenly arched, gently narrowed toward base, without sinuation before posterior angles, posterior angles right-angled, usually with a faint denticle weakly projecting out. Basal foveae (Fig. 3E) densely punctate along inner and outer sulci, as well as on intersulcate area; inner and outer sulci both with well-defined boundaries; inner sulcus straight and oblique, outer sulcus shallower, about half length of inner one; intersulcate area slightly convex; lateral channels relatively wide, with fine but distinct punctures along their full length; area between lateral channel and outer sulcus shallowly ridged, without or with one or two very fine punctures. Pronotal disc with very faint transverse wrinkles aside median line; median line shallow; basal median area with a few punctures near inner sulcus.

Elytra broad and flat, lateral sides slightly expanded behind middle, BW/EL = 0.68–0.69. elytral basal border nearly straight at middle, strongly curved anteriorly near shoulder, forming a faint obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae very finely punctate before middle; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 short with free apex (Fig. 3E). Parascutellar pore present; elytral interval 3 with two setigerous pores, the first pore only slightly anterior to the middle, all pores adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 16–18 pores (6–7, 2–3, 8–9).

Fifth tarsomeres with 4–5 pairs of setae ventrally.

Male sternite VII shallowly but distinctly depressed at middle, the depression somewhat asymmetric and not wrinkled, with a branch extending to the basal-left side of the sternite; with strong isodiametric microsculpture on center of the depression, gradually turned to shallower and transverse microsculpture to lateral regions; apex of sternite truncated (Fig. 2F).

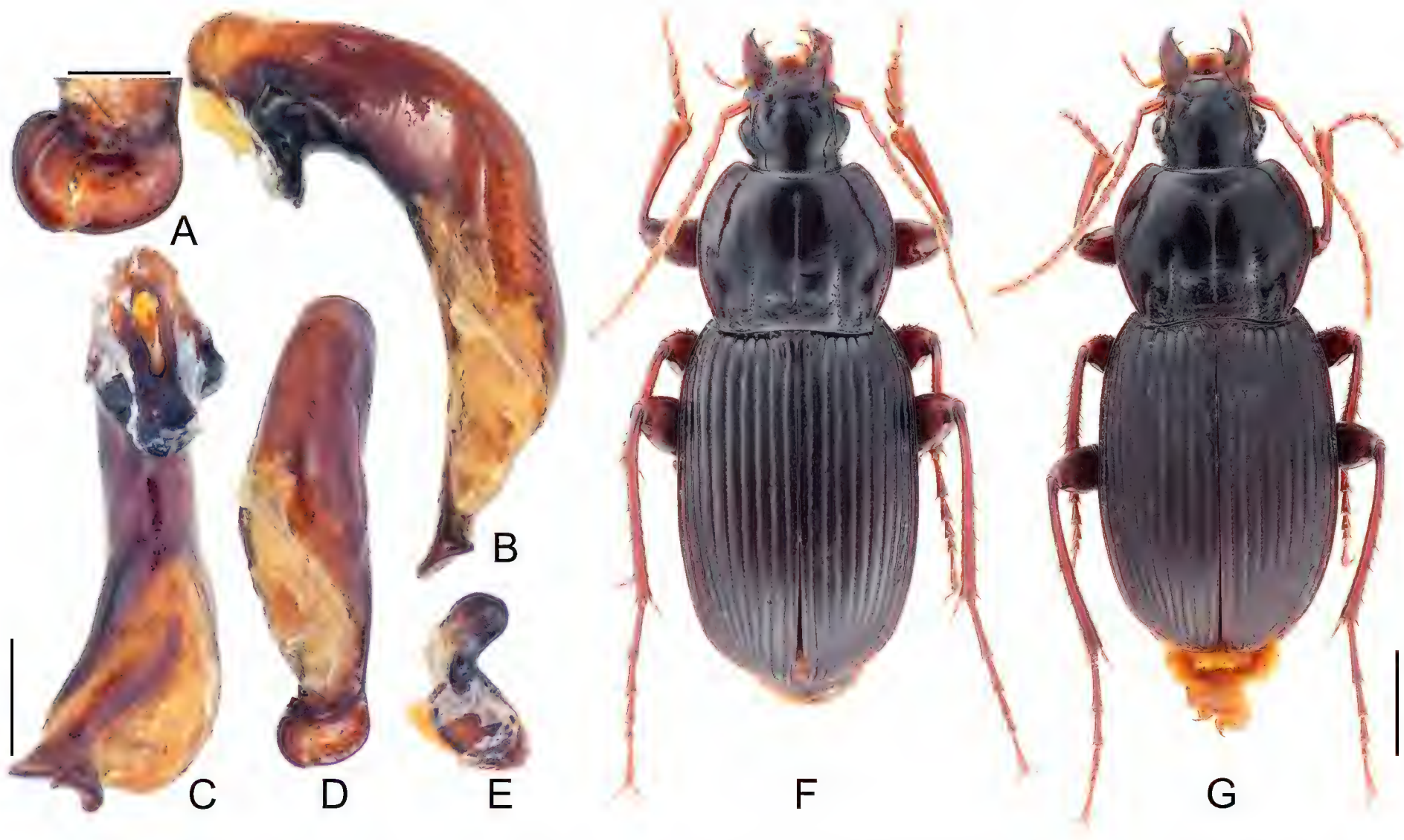

Figure 15. *Pterostichus* (*Morphohaptoderus*) *lingjun* sp. nov. (**A–F.** Holotype; **G.** Paratype, Guanmen Mountain, Shennongjia, Hubei). **A.** Apical lamella, dorsal-apical view; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, ventral view; **D.** Median lobe of aedeagus, dorsal view; **E.** Right paramere; **F.** Habitus, male; **G.** Habitus, female. Scale bars: 0.25 mm (**A**); 0.5 mm (**B–E**); 2.0 mm (**F, G**).

Median lobe of aedeagus (Fig. 15B) stout; in lateral view, ventral margin evenly curved along the full length, nearly straight before apical lamella, abruptly bent ventrally near apex; apical orifice large, strongly turned to left, opened to left-dorsal surface of aedeagus. Ventral surface with a short ridge before apical orifice (Fig. 15C): right ridge sharp, only present on apical orifice and apical lamella; median ridge strongest, from the level of base of apical orifice to midpoint of apical orifice; left ridge absent. Apical lamella relatively thick and short (Fig. 15A), wide in dorsal view, apex widely rounded; with small lamellar denticle on left margin, a little distant from base of apical lamella; in lateral view, lamellar base about in similar length of lamellar apex, lamellar denticle short, distinctly shorter than lamellar apex (laL/ldL = 1.50), nearly collinear with lamellar apex. Right paramere short, apex rounded (Fig. 15E).

Endophallus of male genitalia not studied due to restricted materials.

Gonocoxite 2 of female ovipositor crescent-shaped (Fig. 5E), sharply pointed apically; outer margin with two ensiform setae of normal size, length of the largest ensiform seta ca. 0.06 mm, dorsal margin with one ensiform seta near middle, strongly ridged from the ensiform seta to apex of gonocoxite 2, one nematiform seta located on the apical sixth of outer surface.

Distribution. This species is only known from the type locality, Guanmenshan, in Shennongjia, Hubei Province. The altitude is much lower (1361 m) than other species distributed in Shennongjia.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Li Sao": 名余曰正则兮 [Ming Yu Yue Zheng Ze Xi], 字余曰灵均 [Zi Yu Yue Ling Jun]. This couplet can be translated as: My formal name was Zhengze, and my courtesy name was Lingjun. Lingjun (灵均), which implies equilibrium, is Qu Yuan's declared literary name in "Li Sao." The name is treated as a noun in apposition.

[6] *Pterostichus* (*Morphohaptoderus*) *wangshu* sp. nov.

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Figs 1A, 3F, 5F, 16, 17A–B, 12D–E

Chinese vernacular name: 望舒通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Wufeng County, Houhe Nature Reserve, pitfall trap, 900–1000 m, 2013.VIII.4, Hao Huang leg." [in Chinese] (IZAS). ***Paratypes*: Hubei** • 3 ♂, 1 ♀, the same data as holotype (IZAS & CBFU).

Diagnosis. Large-sized species for the subgenus (BL = 11.7–12.6 mm); elytral microsculpture linear in males, granular in females; antennomere 3 with a few accessory setae; pronotal basal foveae densely punctate; area between lateral channel and outer sulcus shallowly ridged, usually with a few fine punctures; the outer sulcus about half length of the inner one; elytral interval 3 with two setigerous pores, all adjacent to stria 2; male sternite VII very faintly depressed, without wrinkles. Male genitalia

Figure 16. *Pterostichus* (*Morphohaptoderus*) *wangshu* sp. nov. (**A–F.** Holotype; **G.** Paratype, Houhe Nature Reserve, Wufeng County, Hubei). **A.** Apical lamella, dorsal-apical view; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, ventral view; **D.** Median lobe of aedeagus, dorsal view; **E.** Right paramere; **F.** Habitus, male; **G.** Habitus, female. Scale bars: 0.25 mm (**A**); 0.5 mm (**B–E**); 2.0 mm (**F, G**).

with relatively small lamellar tooth, about half as long as the lamellar apex; ventral surface with two short ridges.

Comparisons. The new species, *P. wangshu* sp. nov., is different from all other related species of the subgenus in Hubei by the antennomere 3 with a few accessory setae along the inner margin (Fig. 1A). For the very indistinctly depressed sternite VII in males, *P. wangshu* sp. nov. could be most related to *P. shennongjianus* Facchini & Sciaky. But these two species are different in the following aspects: (1) antennomere 3 with accessory setae in *P. wangshu* sp. nov.; (2) in *P. wangshu* sp. nov., the area between the pronotal lateral channel and the outer sulcus of the basal fovea is typically less convex (Fig. 3F), forming a shallower ridge than in *P. shennongjianus*; (3) elytral interval 3 with two setigerous pores in *P. wangshu* sp. nov., but usually with three or more pores in *P. shennongjianus*; (4) in the male genitalia of *P. wangshu* sp. nov., the lamellar denticle smaller than in *P. shennongjianus*, with its length about half length of the lamellar apex (Fig. 12D, E); (5) the ventral surface of median lobe with two ridges in *P. wangshu* sp. nov. (Fig. 16C), but with only one ridge in *P. shennongjianus* (Fig. 10C); (6) in *P. wangshu* sp. nov. gonocoxite 2 of ovipositor with normal-sized ensiform setae (Fig. 5F), instead with minute ensiform setae in *P. shennongjianus* (Fig. 5B).

From the features on pronotal base and elytral chaetotaxy, *P. wangshu* sp. nov. is externally very similar to *P. quyuani* sp. nov. and *P. lingjun* sp. nov., but the males of *P. wangshu* sp. nov. are different from the latter two species in the sternite VII: only very faintly depressed, but more distinctly depressed in the other two species. Moreover, these species are also very different on the setae of antennomere 3 and the male genitalia. Compared with *P. quyuani* sp. nov., the male genitalia of *P. wangshu* sp. nov. is different for the lamellar denticle much smaller, only about half length of the lamellar apex (Fig. 12D, E). Compared with *P. lingjun* sp. nov., the male genitalia of *P. wangshu* sp. nov. is different for the apical lamella somewhat slighter, and ventral surface of median lobe with two ridges (Fig. 16C).

Description. BL = 11.7–12.6 mm, BW = 4.3–4.8 mm; dorsal surface dark brown to black, appendages brown; elytral microsculpture linear in males, granular in females (Fig. 16F, G).

Head slightly thickened, HW/PW = 0.54–0.55; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal sixth, antennomere 3 with a few accessory setae along inner margin (Fig. 1A); eyes large and hemispherical, tempora shortly swollen behind eyes; submentum with one seta on each side.

Pronotum rounded-rectangular, wider than length, PW/PL = 1.25–1.38, widest near middle, PBW/PW = 0.75–0.79. Anterior margin concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.75–0.76; anterior angles broadly rounded, weakly projecting; lateral margins evenly arched, gently narrowed toward base, without sinuation before posterior angles, posterior angles right-angled, usually with a faint denticle weakly projecting out. Basal foveae (Fig. 3F) densely punctate

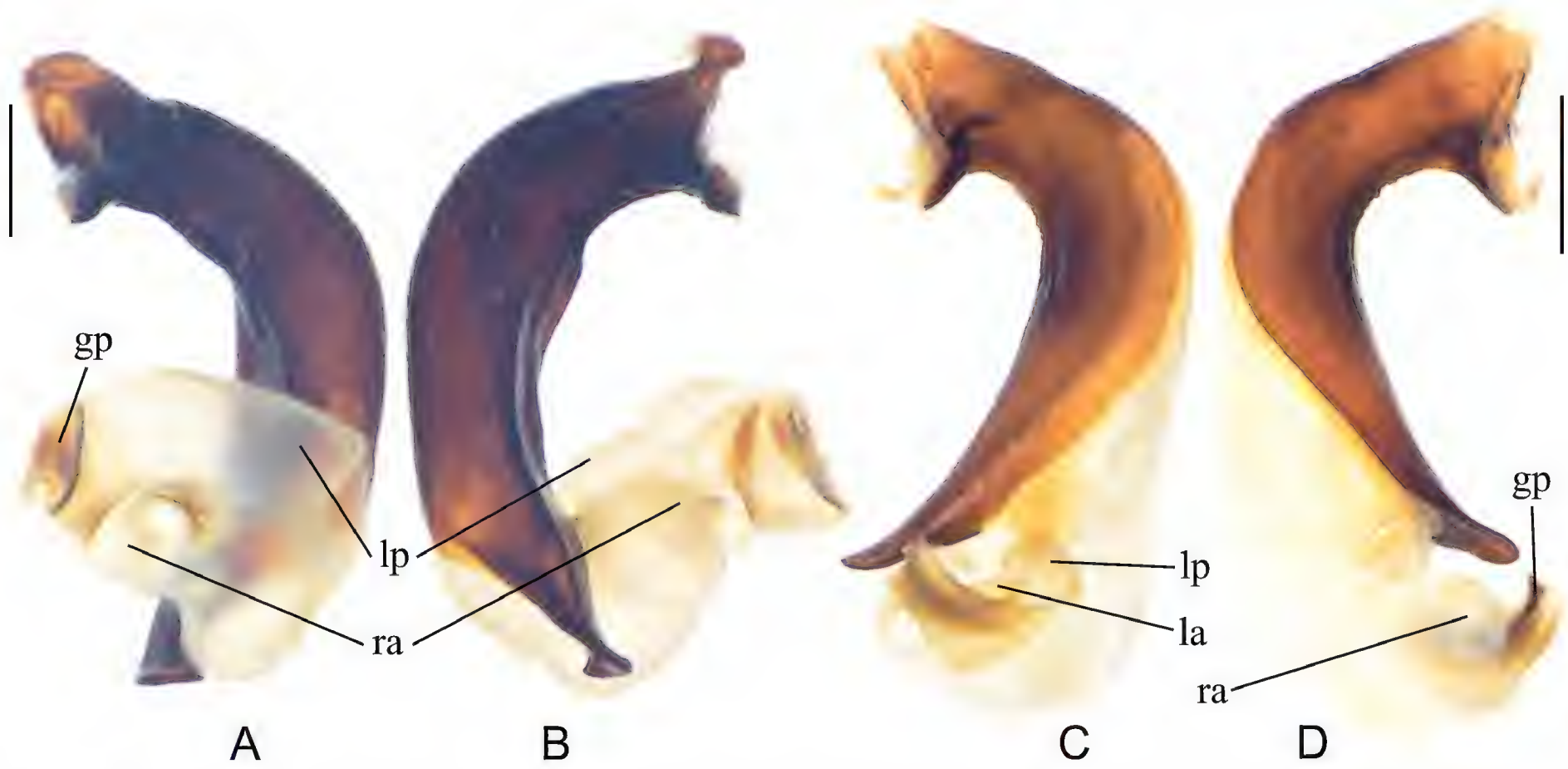

Figure 17. Endophallus of *P.* (*Morphohaptoderus*) spp. **A, B.** *P. wangshu* sp. nov. **A.** Left lateral view; **B.** Right lateral view. **C, D.** *P. zhizheng* sp. nov. **C.** Left lateral view; **D.** Right lateral view. Abbreviations: gp gonopore, lp left pre-apical lobe, la left apical lobe, ra right apical lobe. Scale bars: 0.5 mm.

along inner and outer sulci, as well as on intersulcate area; inner sulcus with well-defined boundaries, straight and oblique; outer sulcus usually less distinct and shallower, about half length of inner one; intersulcate area weakly convex; lateral channels relatively wide, with fine but distinct punctures along their full length; area between lateral channel and outer sulcus very shallowly ridged, usually with a few fine punctures. Pronotal disc sometimes with very faint transverse wrinkles aside median line; median line shallow; basal median area with a few punctures near inner sulcus.

Elytra broad and flat, lateral sides slightly expanded behind middle, BW/EL = 0.66–0.68. Elytral basal border nearly straight, slightly curved anteriorly near shoulder, forming a faint obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae without punctures; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 usually short with free apex (Fig. 3F). Parascutellar pore present; elytral interval 3 with two setigerous pores, the first pore positioned near anterior third, all pores adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 16–18 pores (6–7, 2–3, 8–9).

Fifth tarsomeres with 4–5 pairs of setae ventrally.

Male sternite VII identical to that of *P. shennongjianus* (Fig. 2C), very faintly depressed at middle, with strong isodiametric microsculpture on center of the depression, gradually turned to shallower and transverse microsculpture to lateral regions; apex of sternite rounded.

Median lobe of aedeagus (Fig. 16B) relatively slender compared to similar species; in lateral view, ventral margin evenly curved near basal third, slightly sinuate near apical third, apex abruptly bent ventrally; apical orifice large, strongly turned to left side, opened to left-dorsal surface of median lobe. Ventral surface with two ridges, a sinuate ridge before middle and a straight ridge after middle (Fig. 16C): right ridge sharp and entire except for basal third of aedeagus; median ridge absent; left ridge entire and strongly sinuate. Apical lamella relatively thin (Fig. 16A); rounded in dorsal view, apex widely rounded, slightly twisted to left; with small lamellar denticle on left margin, clearly distant from base of apical lamella; in lateral view, lamellar base distinct, slightly shorter than lamellar apex; lamellar denticle approximately half the length of lamellar apex (laL/ldL = 2.00–2.10), collinear with lamellar apex. Right paramere short, apex rounded (Fig. 16E).

Endophallus (Fig. 17A, B) bent to ventral side across left side of aedeagus, major parts of endophallus located on ventral-left side of aedeagus; gonopore opened to ventral-basal direction of aedeagus; surface with fine scales, densest near gonopore; gonoporal piece fine, falciform. Two distinct lobes recognized: left pre-apical lobe (lp) very large, probably formed by fused lp and la, on the left side of endophallus, decorated with fine scales; right apical lobe (ra) large and rounded, with a small protuberance towards left side of endophallus, on the right side of endophallus and close to gonopore, decorated with fine scales, denser on the protuberance, with a pigment piece on its inner surface, adjacent to the major portion of endophallus.

Gonocoxite 2 of ovipositor in a typical form (Fig. 5F), crescent-shaped, pointed apically; outer margin with two ensiform setae of normal size, length of the largest ensiform seta ca. 0.06 mm; dorsal margin with one ensiform seta near basal third, strongly ridged from the ensiform seta to apex of gonocoxite 2, one nematiform seta located on the apical seventh of outer surface.

Distribution. This species is only known from the Houhe Nature Reserve in Wufeng County, Hubei Province. It is distributed at very low altitudes of 900–1000 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Li Sao": 前望舒使先驱兮 [Qian Wang Shu Shi Xian Qu Xi], 后飞廉使奔属 [Hou Fei Lian Shi Ben Zhu]. This couplet can be translated as: Let Wangshu in front be the vanguard, and make Feilian closely follow behind. In "Li Sao," Wangshu (望舒) is the name of the fairy who drives the chariot for the moon. It can also be referred to as the moon itself in other literature. The name *wangshu* is proper for a *Pterostichus* species because these beetles often run in the moonlight. The name is treated as a noun in apposition.

[7] *Pterostichus* (*Morphohaptoderus*) *hubeicus* Facchini & Sciaky, 2003

Figs 1F, 4D, 18, 19A–B

Chinese vernacular name: 湖北通缘步甲

Pterostichus (*Morphohaptoderus*) *hubeicus* Facchini & Sciaky, 2003: 14, (holotype in CSF; type locality: Hubei: Shennongjia, 31°24'27'N, 110°17'20'E, 2500–2900 m).

Type examined. ***Holotype*: Hubei** • ♂, labeled "CHINA, W-HUBEI, 2500–2900 m, Dashennongjia massif, 31°24'–27'N, 110°17'–20'E, lgt: 28.6.–3.7.95 L.&R. Businsky // HOLOTYPE, *Pterostichus* (*Morphohaptoderus*) *hubeicus* n. sp., Det. Facchini & Sciaky 2000" [red label] (CSF).

Non-type material examined. Hubei • 18 ♂, 16 ♀, labeled "Hubei Province, Shennongjia, Hongping Town, Wenshui Village, 1700 m, pitfall trap, 2013.VIII.13, Hao Huang leg." [in Chinese] (CBFU); • 1 ♂, labeled "Hubei Province, Shennongjia, Shennongding Scenic Area Entrance, 1884 m, pitfall trap, N31.5059, E110.3346, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (CBFU); • 2 ♀, labeled "Hubei Province, Shennongjia, Jinhouling, 2500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (CBFU); • 2 ♀, labeled "Hubei Province, Shennongjia, Shennongding, Jinhouling Crossroad, 2200 m, pitfall trap, N31.4755, E110.3066, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (CBFU); • 2 ♀, labeled "Hubei Province, Shennongjia, Yanziya, 2300 m, pitfall trap, 2013.VIII.19, Hao Huang leg." [in Chinese] (CBFU); • 1 ♀, labeled "Xiaolongtan, Shennongjia, Hubei prov. 5.VIII.2002, Li & Tang leg." (IZAS); • 3 ♀, labeled "China, W Hubei, 23. VI. –14. VII., DASHENNONGJIA mts., 31.5N 110.3E, 2500–2900 m, Jaroslav Turna leg., 2003" (CRS); **Chongqing** • 1 ♀, labeled "Chongqing, Wuxi, Yintiaoling, Guanshan Forest Centre, Shizhuzi, 2137 m, N31.53750, E109.69711 // Fagaceae forest, 2024.VIII.11, Jiaheng Chen & Luyu Wang lgt." (CBFU).

Diagnosis. Medium-small-sized species for the subgenus (BL = 6.3–7.8 mm), BW = 2.5–3.2 mm; elytra with microsculpture linear in both sexes; antennomeres 3 without accessory setae; pronotum nearly quadrate, lateral margins subparalleled behind middle; basal foveae usually with a few fine punctures along inner sulcus and basal margin; outer sulcus shallow and short, inner sulcus

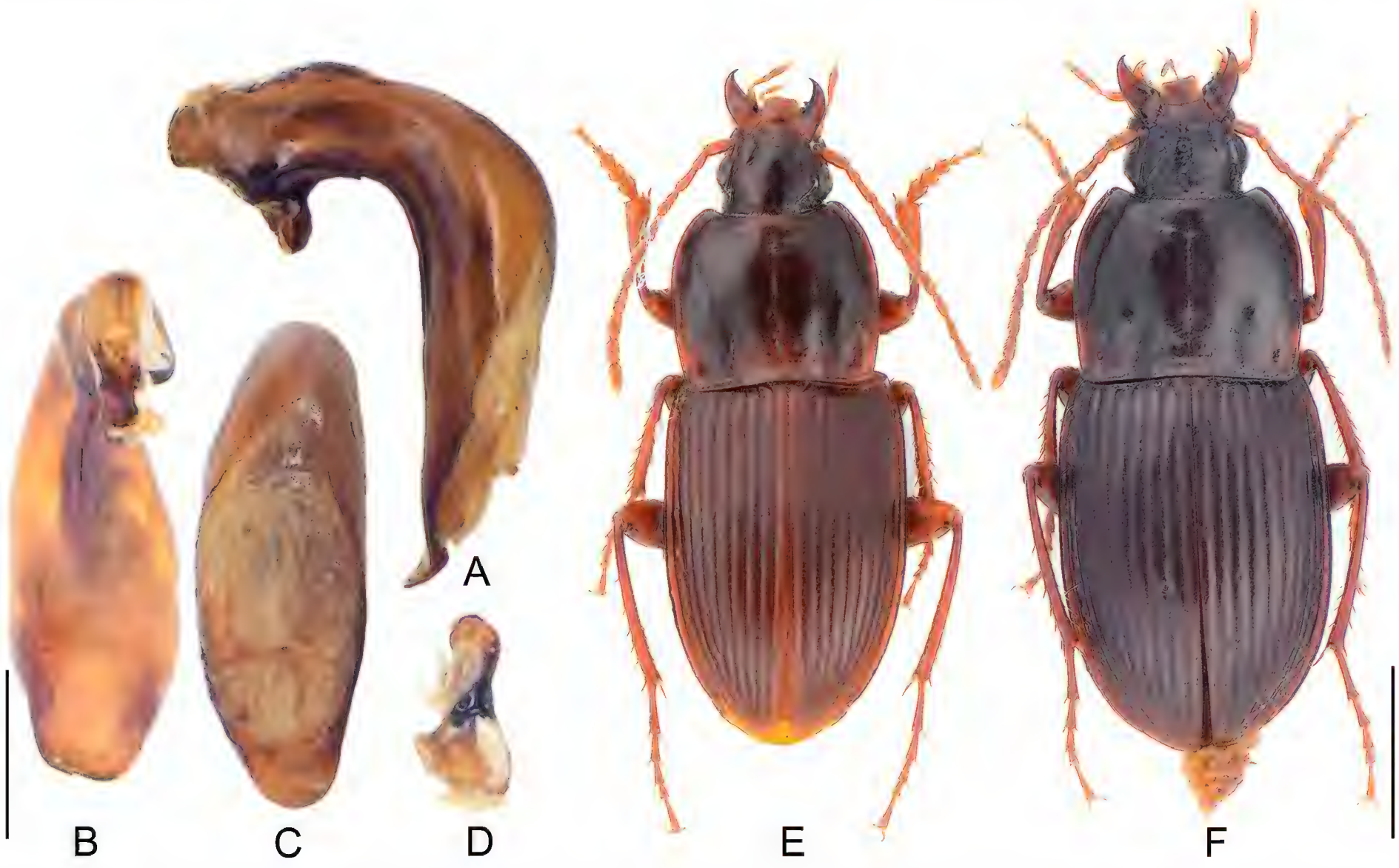

Figure 18. *Pterostichus* (*Morphohaptoderus*) *hubeicus* Facchini & Sciaky, from Shennongjia, Hubei. **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, ventral view; **C.** Median lobe of aedeagus, dorsal view; **D.** Right paramere; **E.** Habitus, male; **F.** Habitus, female. Scale bars: 0.5 mm (**A–D**); 2.0 mm (**E, F**).

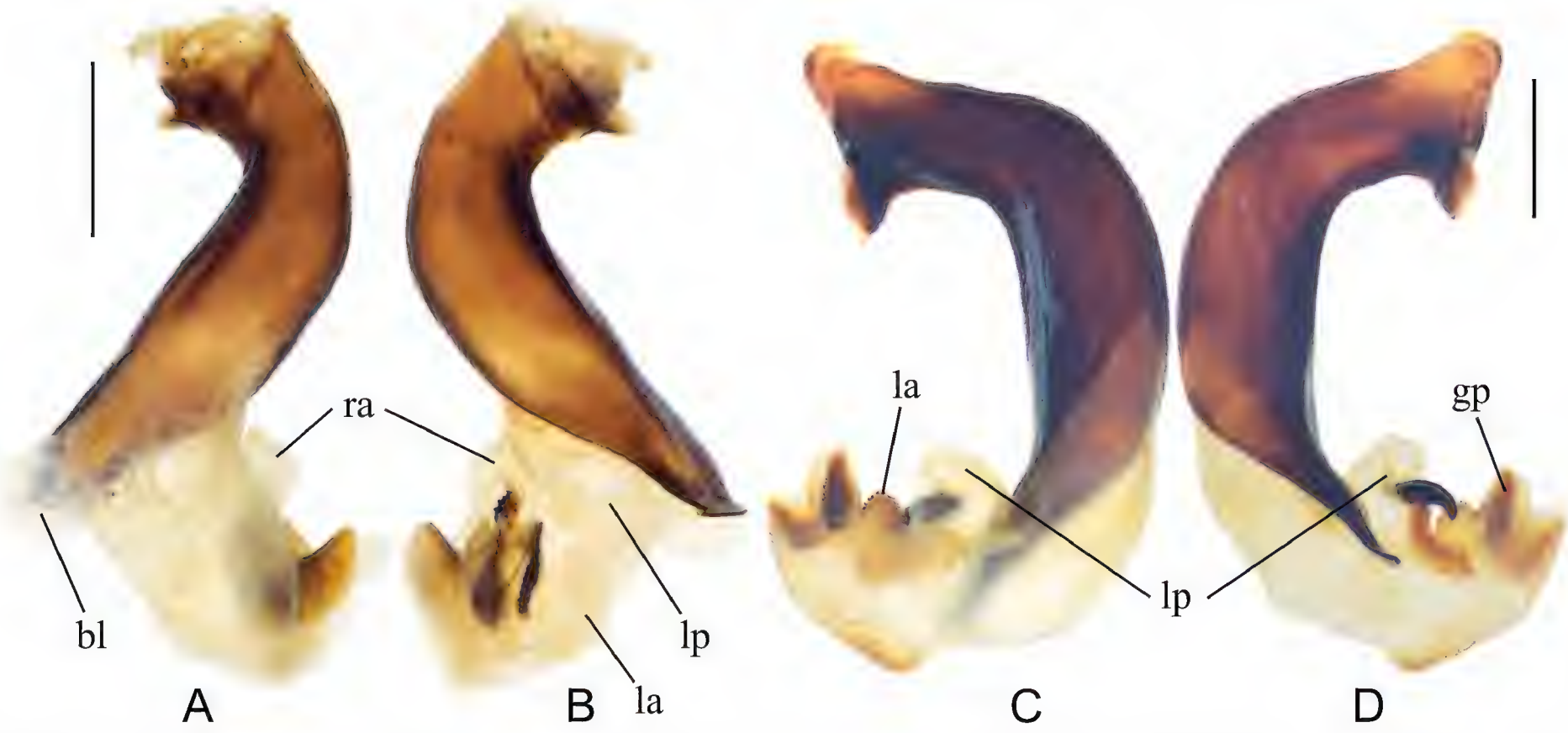

Figure 19. Endophallus of *P.* (*Morphohaptoderus*) spp. **A, B.** *P. hubeicus*. **A.** Left lateral view; **B.** Right lateral view. **C, D.** *P. yaotiao* sp. nov. **C.** Left lateral view; **D.** Right lateral view. Abbreviations: gp gonopore, bl basal lobe, lp left pre-apical lobe, la left apical lobe, ra right apical lobe. Scale bars: 0.5 mm.

usually closer to median line than to lateral margin; elytral humeral tooth sharp, apex distinctly hooked backwards; interval 3 with two setigerous pores, all adjacent to stria 2, first pore positioned near middle of elytra, the other one near apical fourth; fifth tarsomeres with two or three pairs of setae ventrally; male sternites without sexual modification. Apical lamella of aedeagus short and wide, with very small lamellar denticle; ventral surface of median lobe sharply ridged. Gonocoxite 2 of female ovipositor small, widely crescent-shaped, outer margin with two or three large ensiform setae, dorsal margin not ridged, with an ensiform seta near apical third.

Comparisons. This species can be readily differentiated from all other species from Hubei by the relatively small body size; body form subparallele; elytral interval 3 with two pores, all adjacent to striae 2; fifth tarsomere setose ventrally. It is only similar to the species described below, *P. yaotiao* sp. nov. Their comparisons will be provided under the description of the new species.

Compared with species not occurring in Hubei Province, *P. hubeicus* is most similar to *P. janatai* Sciaky & Wrase, 1997 which is distributed in Shaanxi Province. These two species share the following important characteristics: submentum with one seta on each side; pronotum nearly quadrate, not narrowed to base; elytral interval 3 with two setigerous pores, all adjacent to stria 2; median lobe of aedeagus with sharp ventral ridge, without a distinct lamellar denticle. However, *P. hubeicus* can be differentiated from *P. janatai* by the body size much smaller; basal foveae usually with punctures along inner sulcus; apical lamella of aedeagus wider and bent downward.

Description. This species is easily recognizable and has been sufficiently described by Facchini and Sciaky (2003). A redescription is unnecessary here, except for the following supplementary descriptions on the endophallus (Fig. 19A, B): Endophallus bent to right-dorsal side of aedeagus, major parts of endophallus located on dorsal side of aedeagus; gonopore opened to basal-dorsal direction of aedeagus; surface with very fine scales, densest near gonopore; gonoporal piece large and strongly chitinized, comma-shaped. Four distinct lobes recognized: basal lobe (bl) rounded, close to apical lamella, membranous without decoration; left pre-apical lobe (lp) large, protruding towards right side of aedeagus, membranous without decoration; left apical lobe (la) rounded, close to gonopore, with fine scales; right apical lobe (ra) relatively small, visible in both lateral views, decorated with coarse scales; three small but strongly chitinized pieces present near gonopore and base of ra.

Distribution. This species is known from two localities: Shennongjia in Hubei and Wuxi in Chongqing, and is distributed at mid- to high altitudes of 1700–2500 m.

[8] *Pterostichus* (*Morphohaptoderus*) *yaotiao* sp. nov.

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Figs 1B, 1E, 4A, 5J, 19C–D, 20

Chinese vernacular name: 窈窕通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Shennongjia, Hongping Town, Wenshui Village, 1700 m, pitfall trap, 2013.VIII.13, Hao Huang leg." [in Chinese] (IZAS). ***Paratypes*** (a total of 3 ♂ and 9 ♀)**:** • 1 ♂, 9 ♀, the same data as holotype (IZAS & CBFU); • 2 ♂, labeled "Hubei Province, Shennongjia, Hongping Town, Yixiantian, 1500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (CBFU).

Diagnosis. Medium-sized species for the subgenus (BL = 7.9–10.0 mm); elytra with linear microsculpture in both sexes; antennomeres 3 without accessory setae; pronotum nearly quadrate, lateral margins subparalleled behind middle; inner sulcus of pronotal basal fovea usually closer to median line than to lateral margin, outer sulcus short; elytral humeral tooth thick, apex weakly hooked

backwards; elytral interval 3 with two setigerous pores, all adjacent to stria 2; fifth tarsomeres asetose ventrally. Apical lamella of aedeagus elongate, with faint lamellar denticle on left margin, and a large tooth on the right; ventral surface strongly ridged.

Comparisons. This new species, *P. yaotiao* sp. nov., can be readily differentiated from most of the species from Hubei by the body form subparalleled; elytral interval 3 with two pores, all adjacent to striae 2; fifth tarsomere asetose ventrally.

The new species is most closely related to *P. hubeicus* for their similarities on the general body form, pronotal basal foveae, elytral chaetotaxy and the male genitalia, specifically median lobe of aedeagus with longitudinal ridge on ventral surface and the left margin of apical lamella with a faint lamellar denticle. But *P. yaotiao* sp. nov., is different from *P. hubeicus* in the following aspects: (1) body size much larger in *P. yaotiao* sp. nov. (BL = 7.9–10.0 mm), BL = 6.8–7.8 mm in *P. hubeicus*; (2) in *P. yaotiao* sp. nov., elytral humeral tooth thicker, apex weakly hooked backwards (Fig. 4A); whereas in *P. hubeicus*, humeral tooth sharper, apex more distinctly hooked backwards (Fig. 4D); (3) fifth tarsomeres without ventral seta in *P. yaotiao* sp. nov. (Fig. 1E), but with two or three pairs of ventral setae in *P. hubeicus* (Fig. 1F); (4) in *P. yaotiao* sp. nov., the apical lamella of aedeagus much longer and narrower, apex with a tooth near apex of the right margin (Fig. 20C); whereas in *P. hubeicus*, apical lamella of aedeagus shorter and wider, without tooth on right margin (Fig. 18C); (5) ventral surface of median lobe more strongly ridged in *P. yaotiao* sp. nov. (Fig. 20B) than in *P. hubeicus* (Fig. 18B).

The chaetotaxy on elytra of the new species is also similar to many species belonging to the *maximus* group. But *P. yaotiao* sp. nov. is different from them in the body form more laterally parallel; inner sulcus of pronotal basal fovea usually closer to median line than to lateral margin; male sternites without sexual modification; and apical lamella of aedeagus elongate, with very faint lamellar denticle.

Description. BL = 7.9–10.0 mm, BW = 3.4–3.8 mm; dorsal surface dark brown to black, appendages brown; elytra with linear microsculpture in both sexes (Fig. 20E, F).

Head slightly thickened, HW/PW = 0.55–0.59; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal fifth, antennomere 3 without accessory seta (Fig. 1B); eyes large and hemispherical, tempora distinctly swollen behind eyes, the length of tempora a little greater than half length of eyes, eyL/tpL = 1.43–2.00; submentum with one seta on each side.

Pronotum subquadrate, wider than long, PW/PL = 1.16–1.24, widest near apical third, PBW/PW = 0.83–0.85. Anterior margin concaved at middle, distinctly narrower than posterior margin, PAW/PBW = 0.73–0.75; anterior angles broadly rounded, weakly projecting; lateral margins arched along apical third, slightly narrowed on basal two-thirds and nearly straight to posterior angles, posterior angles nearly right-angled, usually with a thick obtuse denticle but slightly projecting out. Basal foveae (Fig. 4A) with distinct fine punctures along inner sulcus; inner sulci shallow and straight, with faintly defined boundary; outer sulci shallower and very short, less than one-third length of inner one, ending at a distance before posterior margin; a basal sulcus present between base of inner sulcus and posterior seta, usually shallowly incised with fine punctures; intersulcate area flat or weakly convex, usually with a few punctures on posterior half; area between lateral margin and outer sulcus flat; lateral channels relatively wide, at least with distinct fine punctures behind middle. Pronotal disc usually without wrinkles aside median line; median line shallow.

Elytra oblong and flat, lateral sides nearly parallel, BW/EL = 0.64–0.68. Elytral basal border nearly straight, slightly curved anteriorly near shoulder, forming a distinct obtuse angle with lateral margin, humeral tooth thick, apex weakly hooked backwards; striae without punctures; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 usually absent or very short (Fig. 4A). Parascutellar pore present; elytral interval 3 with two setigerous pores, both adjacent to stria 2, the anterior setigerous pore positioned near middle of elytra, the posterior one near apical fourth; umbilical pore series on ninth interval sparse in middle, composed of 15–18 pores (5–6, 2–3, 8–10).

Fifth tarsomeres without seta ventrally (Fig. 1E).

Male sternite without secondary sexual modification, apex of sternite VII evenly rounded.

Median lobe of aedeagus (Fig. 20A) stout; in lateral view, ventral margin bent near basal fifth, nearly straight at middle portion before apical fourth, slightly sinuate and then abruptly bent downwardly at apical fourth; apical orifice relatively small, weakly turned to left side, mainly opened to the dorsal surface of median lobe. Ventral surface with a very sharp and long ridge before apical orifice (Fig. 20B): right ridge absent, only indicated on apical orifice; median ridge large and sharp, half-length of median lobe; left ridge absent. Apical lamella strongly elongate and thin; in dorsal view, apical lamella much longer than basal width (AL/AW = 1.70–1.80), apex rounded and slightly capitate, shallowly turned to right side with a large tooth near apex of right margin (Fig. 20C); lamellar denticle very small and faint, present near apical third of left margin. Right paramere short, apex triangular-rounded (Fig. 20D).

Endophallus (Fig. 19C, D) bent to ventral side across the left margin of apical lamella, major parts of endophallus located on ventral side of aedeagus; gonopore opened to basal-ventral direction of aedeagus; surface with coarse scales, densest near gonopore; gonoporal piece short and wide, slightly crenulate on its ventral margin. Two distinct lobes recognized: left pre-apical lobe (lp) large, close to ventral surface of apical lamella, decorated with fine scales, apex with a strongly chitinized piece, claw-shaped; left apical lobe (la) small and rounded, close to gonopore, decorated with coarse scales; ventral surface of endophallus pigmented between base of lp and gonopore.

Gonocoxite 2 of female ovipositor small and crescent-shaped (Fig. 5J), obtuse apically, outer margin with two or three ensiform setae slightly smaller in compare

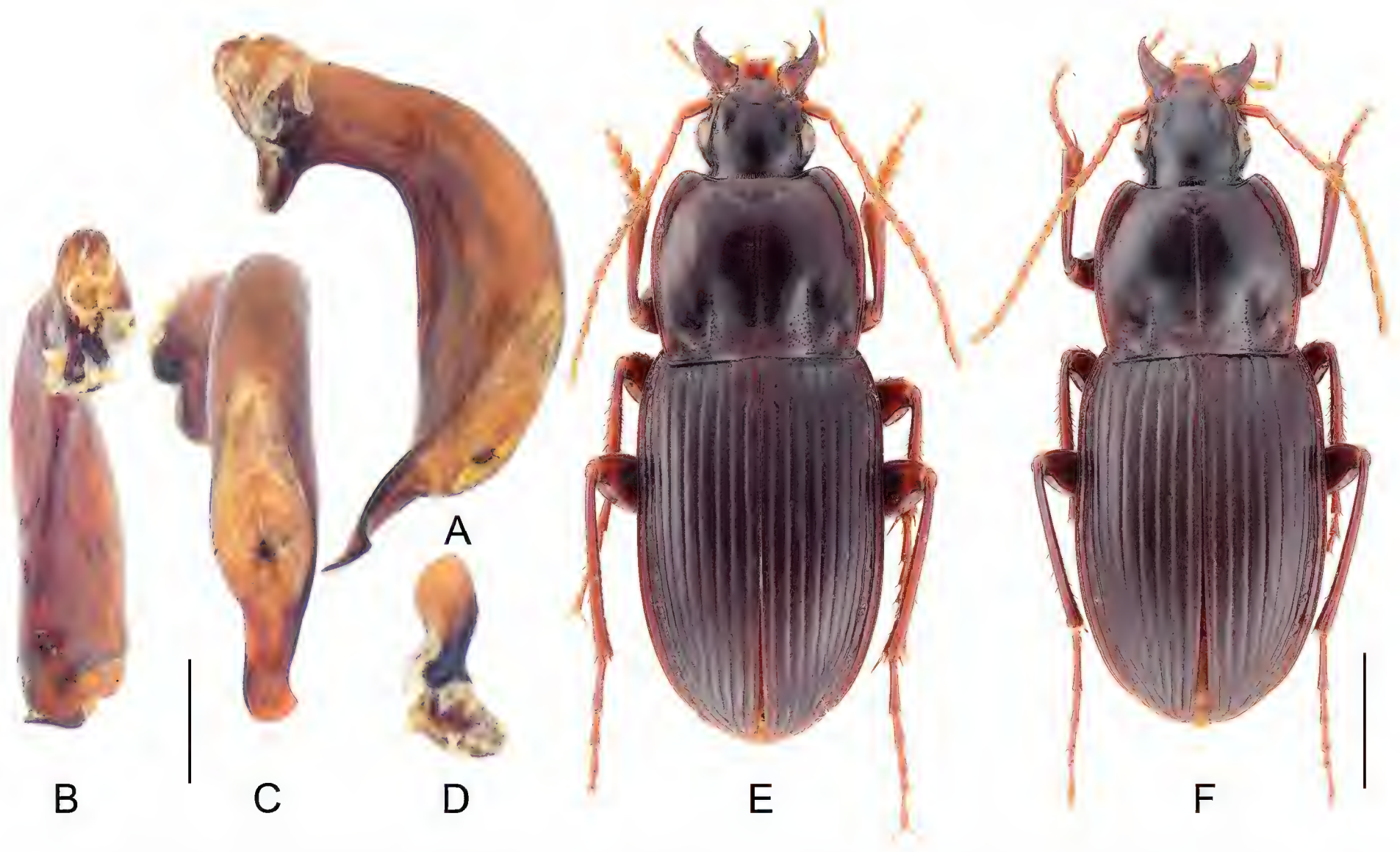

Figure 20. *Pterostichus* (*Morphohaptoderus*) *yaotiao* sp. nov. (**A–E.** Holotype; **F.** Paratype, Wenshui Village, Shennongjia, Hubei). **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, ventral view; **C.** Median lobe of aedeagus, dorsal view; **D.** Right paramere; **E.** Habitus, male; **F.** Habitus, female. Scale bars: 0.5 mm (**A–D**); 2.0 mm (**E, F**).

to other species, length of the largest ensiform seta ca. 0.03 mm; dorsal margin with one ensiform seta near apical third, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical seventh of outer surface.

Distribution. This species is only known from Shennongjia in Hubei and is distributed at mid-altitudes of 1500–1700 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Shan Gui": 既含睇兮又宜笑 [Ji Han Di Xi You Yi Xiao], 子慕予兮善窈窕 [Zi Mu Yu Xi Shan Yao Tiao]. This couplet can be translated as: Looking affectionately and smiling charmingly, you love me for my graceful posture. Yaotiao (窈窕) is a term used to describe the graceful figure of Shangui (Mountain Spirit). As a specific name, *yaotiao* depicts the elegant appearance of the new species. The name is treated as a noun in apposition.

[9] *Pterostichus* (*Morphohaptoderus*) *lianquan* sp. nov.

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Figs 1D, 4C, 5K, 21

Chinese vernacular name: 连蜷通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Wufeng County, Houhe Nature Reserve, pitfall trap, 900–1000 m, 2013.VIII.4, Hao Huang leg." [in Chinese] (IZAS). ***Paratypes*: Hubei** • 3 ♀, the same data as holotype (IZAS & CBFU).

Diagnosis. Medium-sized species for the subgenus (BL = 8.8–9.6 mm); elytra with linear microsculpture in both sexes; antennomeres 3 without accessory setae; pronotum strongly constricted basally, PBW/PW = 0.63–0.69, basal foveal area distinctly punctate, outer sulcus absent; elytral interval 3 with one setigerous pore near midpoint of elytra; fifth tarsomeres asetose ventrally. Apical lamella of aedeagus elongated triangular, longer than basal width.

Comparisons. The present new species, *P. lianquan* sp. nov., is most closely related to the following species, *P. zhizheng* sp. nov. These two new species are different from all other *Morphohaptoderus* species in China by the elytra with only one setigerous pore, and median lobe of aedeagus without ventral ridge, apical lamella not toothed or denticulate. In this aspect, these two new species are only similar to *P. unisetosus* Fedorenko, 2023, from North Vietnam. However, *P. unisetosus* is different from them by the elytra without parascutellar pore, submentum with two setae on each side, median lobe of aedeagus much stouter with shorter apical lamella.

Despite the aforementioned similarities in key characteristics, these two new species have the following distinct differences in external appearances and male genitalia: (1) In *P. lianquan* sp. nov., pronotum very strongly constricted at base, PBW/PW = 0.63–0.67 (Fig. 5K); whereas in *P. zhizheng* sp. nov., pronotum only weakly constricted at base, PBW/PW = 0.75–0.77 (Fig. 5 L). (2) In *P. lianquan* sp. nov., pronotum coarsely and widely punctate on the basal fovea and basal-median

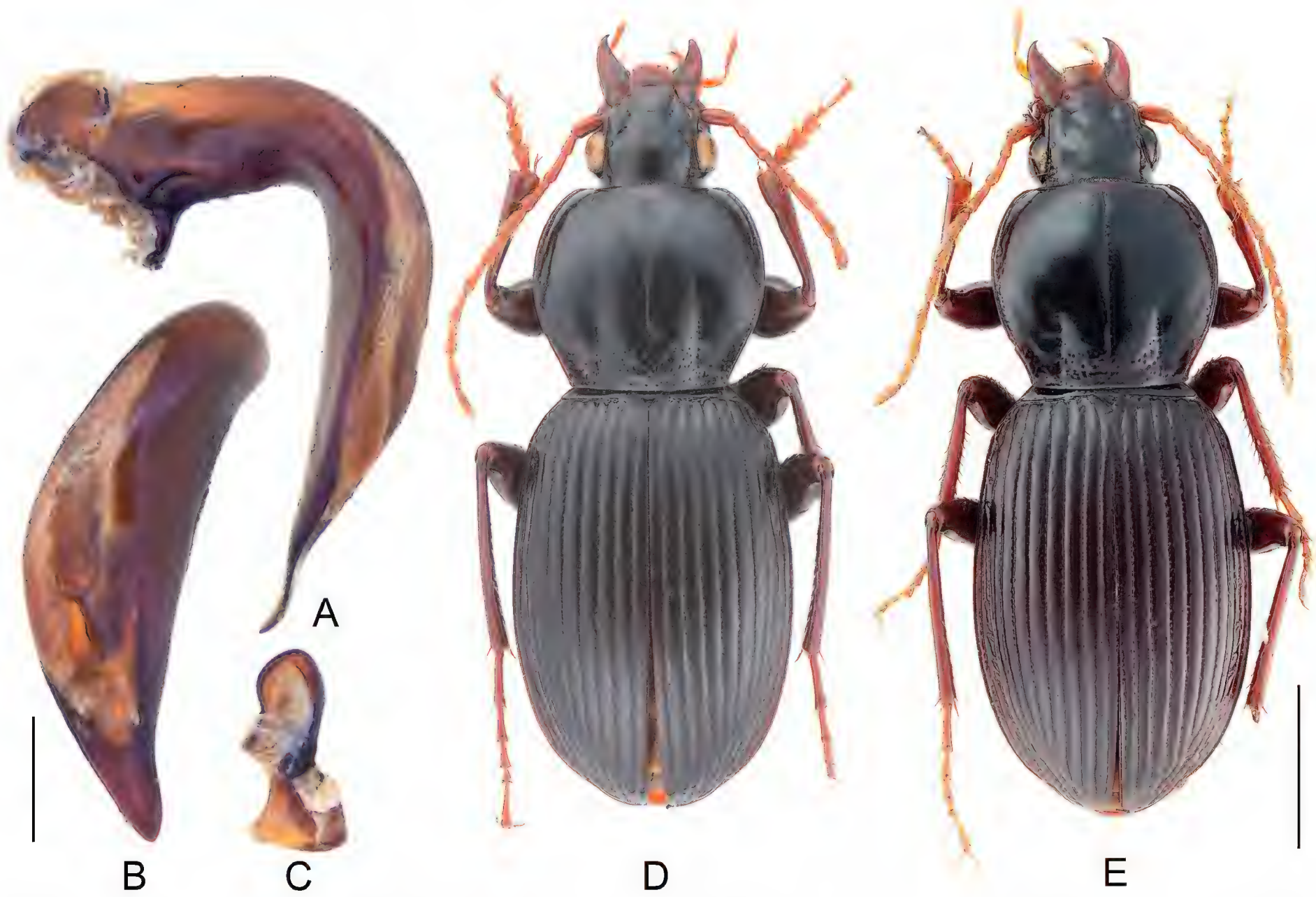

Figure 21. *Pterostichus* (*Morphohaptoderus*) *lianquan* sp. nov. (**A–D.** Holotype; **E.** Paratype, Houhe Nature Reserve, Wufeng County, Hubei). **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, dorsal view; **C.** Right paramere; **D.** Habitus, male; **E.** Habitus, female. Scale bars: 0.5 mm (**A–C**); 2.0 mm (**D, E**).

area; but only with fine punctures along the inner sulcus in *P. zhizheng* sp. nov. (3) Elytral basal border entirely straight in *P. lianquan* sp. nov., but distinctly curved in *P. zhizheng* sp. nov. (4) In *P. lianquan* sp. nov., the apical lamella of aedeagus strongly elongate and attenuate apically, with the length of apical lamella distinctly greater than its basal width (Fig. 21B); conversely, in *P. zhizheng* sp. nov., the apical lamella shorter and wider, length less than its basal width (Fig. 22B).

These two species also have the fifth tarsomere asetose ventrally, and this characteristic is relatively uncommon within the subgenus. Prior to this study, among Chinese species, only *P. geberti* Sciaky & Wrase, 1997, which was discovered in Shaanxi, was known to lack the ventral setae on the fifth tarsomeres. However, we do not consider *P. geberti* to be related to the two new species described here, because *P. geberti* has two setae on each side of the submentum, two setigerous pores on elytral interval 3, and the apical lamella of its aedeagus toothed on the right margin.

Description. BL = 8.8–9.6 mm, BW = 3.2–3.6 mm; dorsal surface dark brown to black, appendages brown; elytra with linear microsculpture in both sexes (Fig. 21D, E).

Head slightly thickened, HW/PW = 0.57–0.59; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal fifth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum nearly circular, slightly wider than length, PW/PL = 1.12–1.16, widest near middle, PBW/PW = 0.63–0.69. Anterior margin weakly concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.82–0.90; anterior angles broadly rounded, hardly projecting; lateral margins evenly arched before middle, strongly constricted basally, straight before posterior angles; posterior angles distinctly obtuse-angled, without denticle. Basal foveae (Fig. 4C) with distinct coarse punctures along inner sulcus, scattered on the basal-median area and usually a few them aggregated near posterior angles; inner sulcus straight and long, shallowly incised without well-defined boundaries; outer sulcus absent, basal fovea completely plain between inner sulcus and lateral margin; lateral channels relatively narrow, with distinct punctures along their full length. Pronotal disc without wrinkles aside median line; median line shallow.

Elytra oblong and flat, humeral area distinctly narrowed, lateral sides slightly curved and expanded near middle, BW/EL = 0.65–0.70. Elytral basal border completely straight, forming a distinct obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae finely but distinctly punctate on basal third; parascutellar striole joined to apical portion of stria 1, angular

base of stria 1 usually absent (Fig. 4C). Parascutellar pore present; elytral interval 3 with only one setigerous pore near midpoint of elytra, adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 16–18 pores (6–7, 1–2, 8–9).

Male profemora slightly thicker than in females; fifth tarsomeres without seta ventrally.

Male sternite without secondary sexual modification, apex of sternite VII evenly rounded.

Median lobe of aedeagus (Fig. 21A) slender; in lateral view, ventral margin distinctly bent near basal third, basal portion about right-angled to apical portion; ventral margin straight near middle, weakly sinuate at apical lamella, apex gently bent ventrally; apical orifice narrow and long, slightly turned to left side, opened to the dorsal surface of median lobe. Ventral surface without ridge. Apical lamella thin in lateral view; narrow and elongated with sharp apex in dorsal view, attenuate apically, shaped as a narrow triangle slightly inclined to the right side (Fig. 21B), length much greater than its basal width (AL/AW = 1.60–1.70). Right paramere short, apex auricular (Fig. 21C).

Endophallus of male genitalia not studied due to restricted materials.

Gonocoxite 2 of female ovipositor wide and crescent-shaped (Fig. 5K), strongly pointed apically, outer margin with two or three ensiform setae in relatively large size, length of the largest ensiform seta ca. 0.05 mm; dorsal margin with one ensiform seta, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical fifth of outer surface.

Distribution. This species is only known in the type locality, Houhe Nature Reserve in Wufeng County, Hubei Province. It is distributed at relatively low altitudes of 900–1000 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Yun Zhong Jun": 灵连蜷兮既留 [Ling Lian Quan Xi Ji Liu], 烂昭昭兮未央 [Lan Zhao Zhao Xi Wei Yang]. This couplet depicts a scene in which a dancer, seemingly possessed by a deity, exhibits a lithe and graceful figure and shines dazzlingly. Lianquan (连蜷) is a term used to describe a lithely dancing figure in the poem. As a specific name, *lianquan* depicts the elegant and relatively lightweight body build of the new species. The name is treated as a noun in apposition.

[10] *Pterostichus* (*Morphohaptoderus*) *zhizheng* sp. nov.

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Figs 4B, 5 L, 17C–D, 22

Chinese vernacular name: 质正通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Wufeng County, Houhe Nature Reserve, pitfall trap, 900–1000 m, 2013.VIII.4, Hao Huang leg." [in Chinese] (IZAS). ***Paratypes*** (a total of 3 ♂ and 5 ♀)**: Hubei** • 3 ♂, 4 ♀, the same data as holotype (IZAS & CBFU); • 1 ♀, labeled "China, Hubei, Wufeng county, Houhe Natural Reserve // 30°05'09"N, 110°33'05"E, along path in a mixed forest, bamboo, leaf litter, sifted, 1160 m, 06.VII.2013, Dai, Peng, Xie leg." (IZAS).

Diagnosis. Medium-sized species for the subgenus (BL = 8.8–9.5 mm); elytra with linear microsculpture in both sexes; antennomeres 3 without accessory setae; pronotum circular-quadrate, lateral margins slightly constricted basally, PBW/PW = 0.75–0.77, basal foveal area with indistinct punctures along inner sulcus, outer sulcus short and shallowly impressed; elytral interval 3 with one setigerous pore near midpoint of elytra; fifth tarsomeres asetose ventrally. Apical lamella of aedeagus large and wide.

Comparisons. As discussed above, this new species is most closely related to *P. lianquan* sp. nov. described above. Their comparison has been provided under the description under that new species. From the general habitus, *P. zhizheng* sp. nov. is externally similar to another new species also from Hubei, *P. yaotiao* sp. nov. Despite their quite different male genitalia, *P. yaotiao* sp. nov. is also distinguishable from *P. zhizheng* sp. nov. in that pronotum usually more distinctly punctate on basal foveae and basal-median area, pronotum outline more quadrate, and elytral interval 3 with two setigerous pores.

Description. BL = 8.8–9.5 mm, BW = 3.3–3.8 mm; dorsal surface dark brown to black, appendages brown; elytra with linear microsculpture in both sexes (Fig. 22D, E).

Head slightly thickened, HW/PW = 0.53–0.57; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal sixth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum circular-quadrate, wider than length, PW/PL = 1.21–1.26, widest near middle; posterior margin slightly narrower than greatest width, PBW/PW = 0.72–0.77. Anterior margin concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.80–0.86; anterior angles broadly rounded, distinctly projecting; lateral margins evenly and slightly arched along their full length, nearly straight before posterior angles, slightly constricted to base; posterior angles nearly right angled, without projecting denticle. Basal foveae (Fig. 4B) nearly impunctate, only with very fine punctures along inner sulcus; inner sulcus straight and long, shallowly incised, with well-defined boundaries; outer sulcus very short and shallow, but always recognizable, less than one-third length of inner one, ending at a distance before posterior margin of pronotum; area between inner sulcus and lateral margin usually flat and impunctate, occasionally with a few fine punctures near base of outer sulcus; lateral channels very narrow, without punctures, abruptly ending at the seta near posterior angle. Pronotal disc without wrinkles aside median line; median line shallow; basal median area without puncture.

Elytra oblong and flat, humeral area normal in the subgenus, distinctly wider than *P. lianquan* sp. nov.; lateral sides nearly parallel, very faintly expanded near middle,

BW/EL = 0.65–0.73. Elytral basal border shallowly but distinctly curved at middle, forming a distinct obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae without punctures but faintly crenulate near base; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 usually short with free apex (Fig. 4B). Parascutellar pore present; elytral interval 3 with only one setigerous pore near midpoint of elytra, adjacent to stria 2; umbilical pore series on ninth interval sparse in middle, composed of 15–16 pores (5–6, 1–2, 8–9).

Male profemora slightly thicker than in females; fifth tarsomeres without setae ventrally.

Male sternite without secondary sexual modification, apex of sternite VII evenly rounded.

Median lobe of aedeagus (Fig. 22A) relatively slender; in lateral view, ventral margin distinctly and evenly bent near basal fifth, evenly curved along the length of middle portion, apex gradually but distinctly bent ventrally; apical orifice very large, not turned to left, opened to the dorsal surface of median lobe. Ventral surface without ridge. Apical lamella thin in lateral view; very large and wide in dorsal view, apex widely rounded, faintly turned to right side, length subequal to basal width (AL/AW = 0.90–1.00). Right paramere short, apex rounded (Fig. 22C).

Endophallus (Fig. 17C, D) bent to ventral side across the apex of apical lamella, major parts of endophallus located on dorsal side of aedeagus; gonopore opened to ventral-basal direction of aedeagus; surface with coarse scales, densest near gonopore; gonoporal piece crescent-shaped, small and sharp. Three distinct lobes recognized: left pre-apical lobe (lp) relatively large and rounded, on the left side of endophallus, decorated with coarse scales; left apical lobe (la) small and oblate, close to gonopore, decorated with fine scales, slightly pigmented near base of its apical surface; right apical lobe (ra) relatively large, rounded, on the right side of endophallus and near gonopore, with fine scales.

Gonocoxite 2 of female ovipositor narrow and crescent-shaped (Fig. 5 L), sharply pointed apically, outer margin with two or three ensiform setae in relatively large size, length of the largest ensiform seta ca. 0.05 mm; dorsal margin with one ensiform seta, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical third of outer surface.

Distribution. This species is only known in the type locality, Houhe Nature Reserve in Wufeng County, Hubei Province. It is distributed at relatively low altitudes of 900–1160 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Huai Sha": 内厚质正兮 [Nei Hou Zhi Zheng Xi], 大人所晟 [Da Ren Suo Sheng]. This couplet can be translated as: My inner self is rich and righteous and is praised by aspiring personages. Zhizheng (质正) is a term used to describe the integrity of a person in the poem. As a specific name, *zhizheng* implies the new species having a relatively robust and solid habitus compared to its relatives. The name is treated as a noun in apposition.

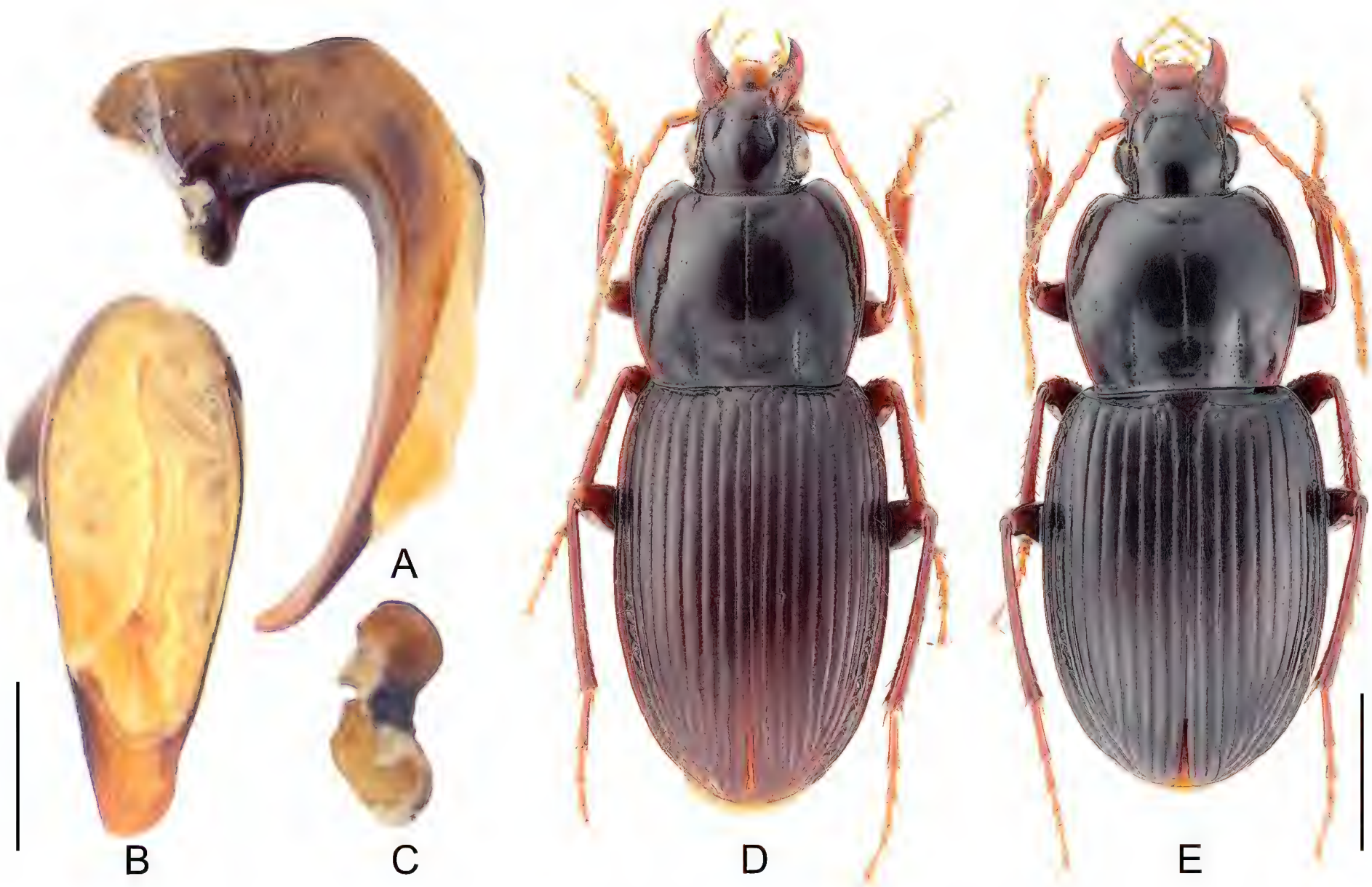

Figure 22. *Pterostichus* (*Morphohaptoderus*) *zhizheng* sp. nov. (**A–D.** Holotype; **E.** Paratype, Houhe Nature Reserve, Wufeng County, Hubei). **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, dorsal view; **C.** Right paramere; **D.** Habitus, male; **E.** Habitus, female. Scale bars: 0.5 mm (**A–C**); 2.0 mm (**D, E**).

[11] *Pterostichus* (*Morphohaptoderus*) *toledanoi* Facchini & Sciaky, 2003

Figs 4E, 5G, 23

Chinese vernacular name: 托莱通缘步甲

Pterostichus (*Morphohaptoderus*) *toledanoi* Facchini & Sciaky, 2003: 11, (holotype in CSF; type locality: Hubei: Shennongjia, 31°24'27'N, 110°17'20'E, 2500–2900 m).

Type examined. *Holotype*: Hubei • ♂, labeled "CHINA, W-HUBEI, 2500–2900 m, Dashennongjia massif, 31°24'–27'N, 110°17'–20'E, lgt: 28.6.–3.7.95 L.&R. Businsky // HOLOTYPE, *Pterostichus* (*Morphohaptoderus*) *toledanoi* n. sp., Det. Facchini & Sciaky 2000" [red label] (CSF). ***Paratypes*: Hubei** • 1 ♂, 1 ♀, the same data as holotype but labeled as paratype (IZAS).

Non-type material examined. Hubei • 1 ♀, labeled "Hubei Province, Shennongjia, Shennongding, N31.4531°, E110.2681°, under stone, 2890 m, 2022. VII.27, Hongliang Shi & Ganyan Yang leg." [in Chinese] (CBFU); • 5 ♂, labeled "Hubei, Shennongjia, Badongya, 2700 m, 1980.VII.23, Peiyu Yu leg." [in Chinese]; • 1 ♂, 3 ♀, labeled "Jinhouling, Shennongjia, Hubei prov. 4.VIII.2002, Li & Tang leg." (IZAS).

Diagnosis. Medium-small-sized species for the subgenus (BL = 7.5–7.8 mm); elytra with linear microsculpture in both sexes; antennomere 3 without accessory seta; pronotum nearly quadrate, lateral margins subparalleled behind middle; outer sulcus of pronotal basal fovea oblique to posterior margin of pronotum; elytral interval 3 with three setigerous pores, the basal one adjacent to stria 3, the other two adjacent to stria 2; fifth tarsomeres with 2–3 pairs of setae ventrally; male sternites simple; apical lamella of aedeagus large and capitate, apex truncated in lateral view.

Comparisons. This species can be easily distinguished from nearly all other species of the subgenus *Morphohaptoderus* in China by its specific elytral chaetotaxy. Some species from Sichuan and one from Shaanxi (*P. ming* Sciaky & Wrase, 1997) also have three setigerous pores on elytral interval 3. Nevertheless, in these species, the middle pore on the interval is always adjacent to striae 3, and the submentum has two setae on each side. In contrast, in *P. toledanoi*, the middle pore on the interval is adjacent to striae 2, while the submentum has only one seta on each side. This species can be confused only with the new species described below, *P. xuanzhang* sp. nov. Detailed comparisons between them will be presented under the description of the new species.

Description. Very similar to *P. xuanzhang* sp. nov. externally. A complete redescription of external characters is unnecessary here, except for the following, which differ from *P. xuanzhang* sp. nov.

BL = 7.5–7.8 mm, BW = 3.1–3.2 mm; HW/PW = 0.58–0.59; tempora swollen behind eyes, about one-third length of eyes, eyL/tpL = 3.00–3.14. Pronotum subquadrate, PW/PL = 1.35–1.37, PBW/PW = 0.89–0.92, PAW/PBW = 0.67–0.71; posterior margin very strongly concaved at middle; outer sulcus of pronotal basal fovea distinctly oblique to the basal margin of pronotum, forming an angle at about 75° (Fig. 4E). BW/EL = 0.69–0.72.

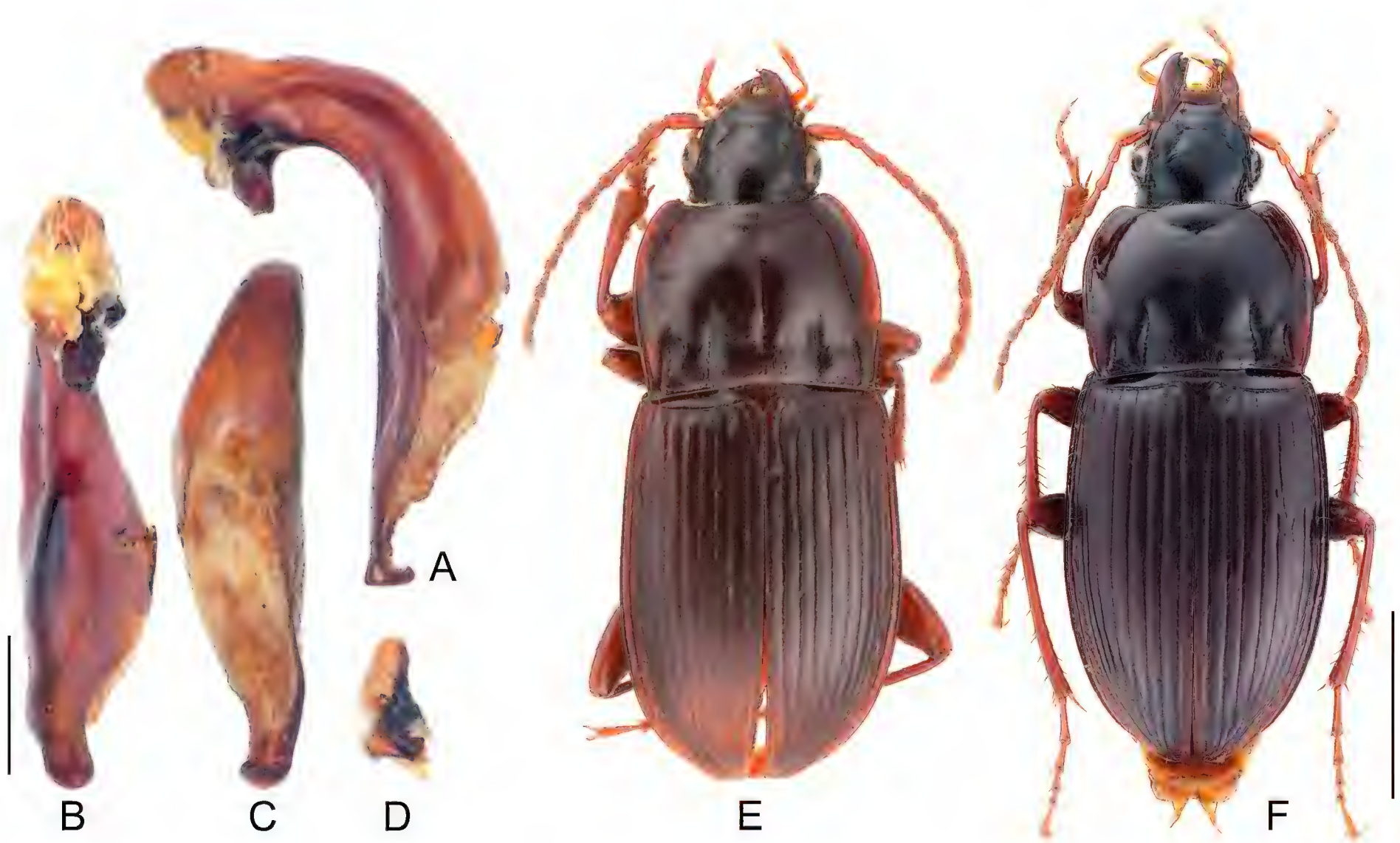

Figure 23. *Pterostichus* (*Morphohaptoderus*) *toledanoi* Facchini & Sciaky, from Shennongjia, Hubei. **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, ventral view; **C.** Median lobe of aedeagus, dorsal view; **D.** Right paramere; **E.** Habitus, male; **F.** Habitus, female. Scale bars: 0.5 mm (**A–D**); 2.0 mm (**E, F**).

Median lobe of aedeagus (Fig. 23A) relatively slender; in lateral view, ventral margin curved near basal third, nearly straight at middle, apex faintly bent ventrally; apical orifice relatively small, weakly turned to left side. Ventral surface with a straight sharp ridge extended from aedeagal base to nearly apex of apical lamella (Fig. 23B). Apical lamella thick and capitate (Fig. 23C), strongly bent upward, in lateral view, extreme apex truncated and slightly hooked at dorsal end; in dorsal view, apical lamella relatively long, in similar length as basal width (AL/AW = 0.99–1.01), slightly bent to the left side. Right paramere short, apex rounded (Fig. 23D).

Endophallus of male genitalia not studied. Gonocoxite 2 of female ovipositor relatively large, slightly crescent-shaped (Fig. 5G), strongly obtuse apically; outer margin with two ensiform setae of normal size, length of the largest ensiform seta ca. 0.05 mm; dorsal margin with one ensiform seta near basal third, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical tenth of outer surface.

Distribution. This species is only known from Shennongjia in Hubei and is distributed at high altitudes of 2500–2890 m.

[12] *Pterostichus* (*Morphohaptoderus*) *xuanzhang* sp. nov.

https://zoobank.org/6E70620D-A46F-4E5A-9DB2-CCE47B6948B0

Figs 4F, 5H, 24

Chinese vernacular name: 玄章通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Shennongjia, Badongya, 2700 m, 1980.VII.23, Peiyu Yu leg." [in Chinese] (IZAS). ***Paratypes*** (a total of 1 ♂ and 3 ♀)**: Hubei** • 1 ♂, 1 ♀, the same data as holotype (IZAS); • 1 ♀, labeled "Jinhouling, Shennongjia, Hubei prov. 4.VIII.2002, Li & Tang leg." (IZAS); • 1 ♀, labeled "Hubei, Shennongjia, Jiuhuping, 1800–1950 m, N31.5085, E110.3485, 2025.IV.5, Yifan Wang lgt." (CBFU).

Diagnosis. Medium-small-sized species for the subgenus (BL = 7.7–8.3 mm); elytra with linear microsculpture in both sexes; antennomere 3 without accessory seta; pronotum nearly quadrate, lateral margins subparalleled behind middle; outer sulcus of pronotal basal fovea verticle to posterior margin of pronotum; elytral interval 3 with three setigerous pores, the basal one adjacent to stria 3, the other two adjacent to stria 2; fifth tarsomeres with 2–3 pairs of setae ventrally; male sternites simple; apical lamella of aedeagus small, slightly capitate, apex rounded in lateral view.

Comparisons. The new species is only similar to *P. toledanoi* for their specific elytral chaetotaxy. These two species are very difficult distinguished by external characters but have distinct differences on the male genitalia. Their differences are explicated as follows: (1) In *P. xuanzhang* sp. nov., the outer sulcus of pronotal basal fovea nearly vertical to the posterior margin of pronotum, forming a right angle to posterior margin (Fig. 4F); whereas in *P. toledanoi*, the outer sulcus distinctly oblique to the posterior margin of pronotum, forming an acute angle at about 75° to posterior margin (Fig. 4E). (2) In *P. xuanzhang* sp. nov., the pronotum posterior margin generally slightly less concaved at middle than in *P. toledanoi*. (3) In the aedeagus of *P. xuanzhang* sp. nov., the ventral surface of median lobe with two short ridges that interlaced with each other near middle portion (Fig. 24B); conversely, in *P. toledanoi*, the ventral surface with one straight long ridge extended from aedeagal base to nearly apex of apical lamella (Fig. 23B). (4) The apical lamella of *P. xuanzhang* sp. nov. much less capitate with apex small and rounded in lateral view (Fig. 24A); but in *P. toledanoi*, the apical lamella strongly capitate with apex large and truncated in lateral view (Fig. 23A).

Description. BL = 7.7–8.3 mm, BW = 3.0–3.2 mm; dorsal surface dark brown to black, appendages brown; elytra with linear microsculpture in both sexes (Fig. 24E, F).

Head slightly thickened, HW/PW = 0.57–0.58; frons without puncture; frontal sulci short and shallow; antennae reaching elytral basal sixth, antennomere 3 without accessory seta; eyes relatively large, tempora swollen behind eyes, about one-third length of eyes, eyL/tpL = 3.10–3.50; submentum with one seta on each side.

Pronotum subquadrate, wider than length, PW/PL = 1.37–1.40, widest near middle; posterior margin wide and moderately concaved at middle, slightly narrower than greatest width, PBW/PW = 0.81–0.82. Anterior margin slightly concaved at middle, distinctly narrower than posterior margin, PAW/PBW = 0.74–0.76; anterior angles broadly rounded, weakly projecting; lateral margins slightly arched along anterior two-thirds, nearly straight along basal third, very faintly sinuate before posterior angles, posterior angles nearly right-angled, without projecting denticle. Basal foveae (Fig. 4F) usually without puncture, at most sporadically punctate along inner sulcus; inner and outer sulci both with well-defined boundaries; inner sulcus straight; outer sulcus a little more than half length of inner sulcus, nearly vertical to posterior margin of pronotum, forming a right angle to posterior margin; intersulcate area weakly convex; area between lateral margin and outer sulcus shallowly convex; lateral channels very narrow, without puncture. Pronotal disc without wrinkles aside median line; median line shallow; basal median area without puncture.

Elytra oblong and flat, lateral sides nearly parallel, faintly expanded near middle, BW/EL = 0.65–0.70. Elytral basal border nearly straight, slightly curved near shoulder, forming a distinct obtuse angle with lateral margin, humeral tooth small but distinct, apex faintly pointed; striae deeply incised, impunctate; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 short with free apex (Fig. 4F). Parascutellar pore present; interval 3 with three setigerous pores, the first one adjacent to stria 3, the other two adjacent to stria 2; the first pore near basal fourth of elytra, the second one near middle, and the last one near apical fourth; umbilical pore series on ninth interval sparse in middle, composed of 15–16 pores (5–6, 2–3, 7–8).

Figure 24. *Pterostichus* (*Morphohaptoderus*) *xuanzhang* sp. nov. (**A–E.** Holotype; **F.** Paratype, Jiuhuping, Shennongjia, Hubei). **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, ventral view; **C.** Median lobe of aedeagus, dorsal view; **D.** Right paramere; **E.** Habitus, male; **F.** Habitus, female. Scale bars: 0.5 mm (**A–D**); 2.0 mm (**E, F**).

Male profemora slightly thicker than in females; fifth tarsomeres with 2–3 pairs of setae ventrally.

Male sternite without secondary sexual modification, apex of sternite VII evenly rounded.

Median lobe of aedeagus (Fig. 24A) stouter than the previous species; in lateral view, ventral margin gradually curved at basal third, apex slightly bent ventrally; apical orifice small, weakly turned to left side. Ventral surface with two interlaced ridges (Fig. 24B): the left ridge short, extended from aedeagal base to near basal third of ventral margin; the right ridge longer and stronger, started before the end of left ridge, slightly sinuate and extended to the middle of apical orifice; these two ridges shortly interlaced near basal third of median lobe. Apical lamella thick and capitate, slightly bent upward, in lateral view, extreme apex small and rounded, not hooked; in dorsal view, apical lamella relatively short, length less than basal width (AL/AW = 0.59–0.61). Right paramere short, apex rounded (Fig. 24D).

Endophallus of male genitalia not studied. Gonocoxite 2 of female ovipositor relatively small, slightly crescent-shaped (Fig. 5H), distinctly obtuse apically; outer margin with two ensiform setae of normal size, length of the largest ensiform seta ca. 0.04 mm; dorsal margin with one ensiform seta near basal third, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical ninth of outer surface.

Distribution. This species is only known from Shennongjia, Hubei Province. It is distributed at mid-high altitudes of about 1800–2700 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Huai Sha": 玄文处幽兮 [Xuan Wen Chu You Xi], 蒙瞍谓之不章 [Meng Sou Wei Zhi Bu Zhang]. This couplet can be translated as: If delicate black carvings were placed in the darkness, they would remain unseen by the obtuse. This implies that Qu Yuan's talent was not appreciated by others. Xuanzhang (玄章) refers to the delicate black carvings. The name *xuanzhang* is appropriate for a *Pterostichus* species, because these beetles are almost always black-colored with an elegant structure. The name is treated as a noun in apposition.

[13] *Pterostichus* (*Morphohaptoderus*) *rongyu* sp. nov.

https://zoobank.org/E0BDB237-B447-4E89-8E70-9E9378701CCE

Figs 4H, 5N, 25

Chinese vernacular name: 容与通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "Hubei Province, Shennongjia, Guanmenshan, N31.4362, E110.3824, pitfall trap, 1361 m, 2022.VII.29, Hongliang Shi & Ganyan Yang leg." [in Chinese] (IZAS). ***Paratype*: Chongqing** • 1 ♀, labeled "Chongqing, Wuxi, Yintiaoling, Luomadian, Huanglianchanggou, 1467 m, N31.5414224, E109.850047 // hardwoods & bamboo mixed forest, under stone, 2024.VIII.11; Jiaheng Chen lgt." (CBFU).

Diagnosis. Small-sized species for the subgenus (BL = 5.7–6.1 mm); elytra with linear microsculpture in both sexes; antennomere 3 without accessory on apical half;

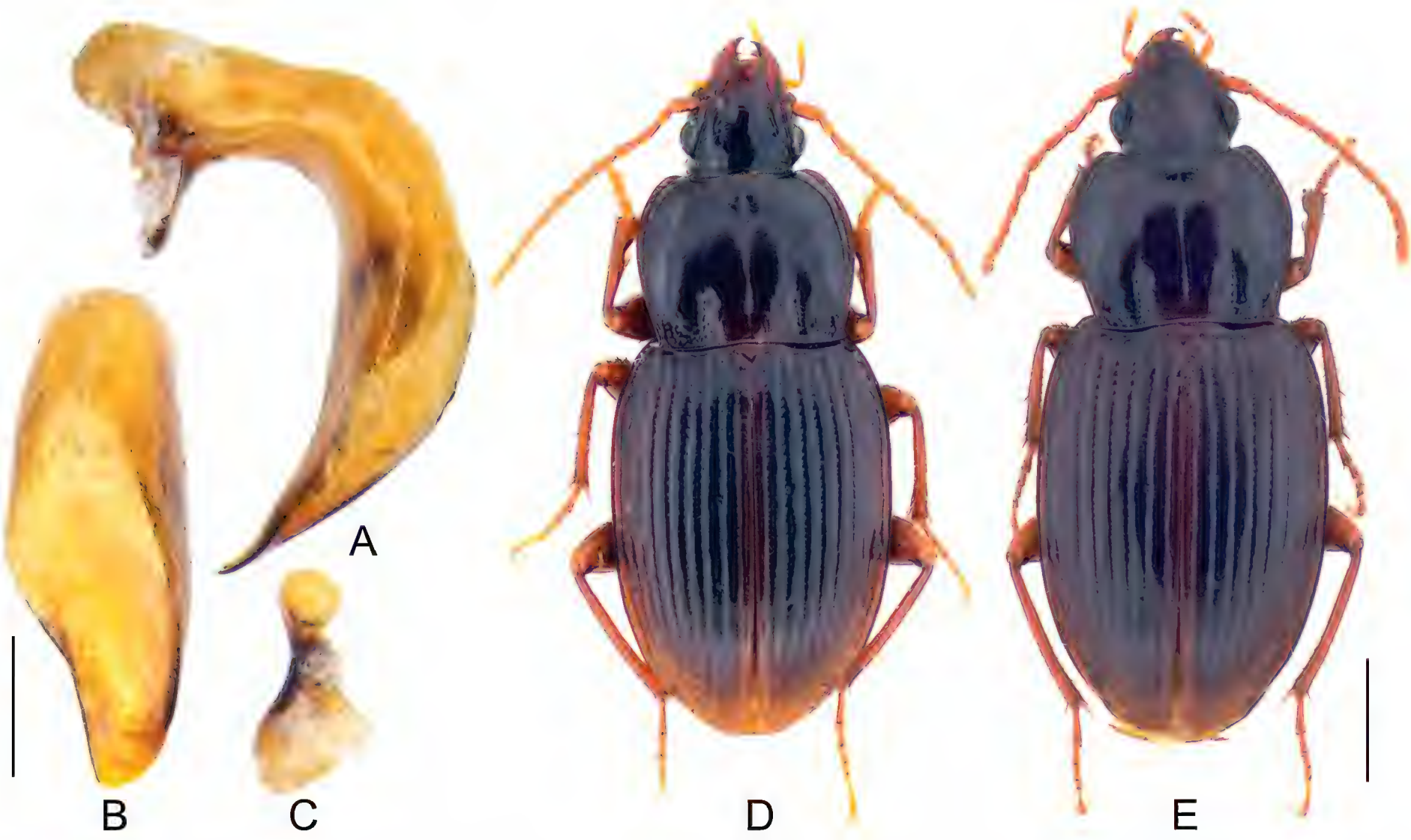

Figure 25. *Pterostichus* (*Morphohaptoderus*) *rongyu* sp. nov. (**A–D.** Holotype; **E.** Paratype, Huanglianchanggou, Yintiaoling, Chongqing). **A.** Median lobe of aedeagus, left lateral view; **B.** Median lobe of aedeagus, dorsal view; **C.** Right paramere; **D.** Habitus, male; **E.** Habitus, female. Scale bars: 0.25 mm (**A–C**); 1.0 mm (**D, E**).

pronotum rounded quadrate; basal foveae coarsely punctate, outer sulcus indistinct; elytral oval, lateral margins distinctly expanded near middle; interval 3 with two setigerous pores, all adjacent to stria 2; fifth tarsomeres without seta ventrally; median lobe of aedeagus without ridge on ventral surface, apical lamella without denticle or tooth.

Comparisons. The present new species, *P. rongyu* sp. nov., is highly distinctive within the subgenus *Morphohaptoderus*. It is characterized by the absence of ventral setae on the fifth tarsomeres and the presence of two setigerous pores on elytral interval 3, both of which are adjacent to stria 2. In this regard, the present new species resembles only *P. yaotiao* sp. nov. However, the two species differ substantially in terms of body size, overall habitus, and male genitalia. Specifically, *P. yaotiao* sp. nov. has a significantly larger body (BL = 7.9–10.0 mm), a more elongate body form with nearly parallel lateral margins, and the median lobe of aedeagus features a ventral ridge and lamellar denticles.

Actually, among all other Chinese species within the subgenus *Morphohaptoderus* that possess two setigerous pores on elytral interval 3 adjacent to stria 2, the male genitalia exhibit a particular form. Specifically, the ventral surface of the median lobe has a ridge, and the apical lamella has lamellar denticle on its left surface. In this regard, *P. rongyu* sp. nov. is very special within the subgenus.

Although they have similar elytral chaetotaxy, we do not consider *P. rongyu* sp. nov. to be related to *P. yaotiao* sp. nov. due to their markedly different male genitalia. Instead, we suspect a relationship between *P. rongyu* sp. nov. and *P. zhizheng* sp. nov. as well as *P. lianquan* sp. nov., even though the latter two species have only one setigerous pore on elytral interval 3. All three of these mentioned species share a relatively simple form of the median lobe of aedeagus, lacking a ventral ridge or apical lamellar denticle. However, *P. zhizheng* sp. nov. and *P. lianquan* sp. nov. can be easily distinguished from *P. rongyu* sp. nov. by their much larger body size, more elongated body form, the presence of only one setigerous pore on interval 3, and the longer apical lamella of the aedeagus.

Description. BL = 5.7–6.1 mm, BW = 2.4–2.7 mm; dorsal surface dark brown to black, appendages brown; elytra with linear microsculpture in both sexes (Fig. 25D, E).

Head slightly thickened, HW/PW = 0.56–0.59; frons without puncture; frontal sulci deep and straight, extended near to the anterior supraorbital seta; antennae filiform, reaching elytral basal sixth, antennomere 3 without accessory seta; eyes large and hemispherical, tempora very shortly swollen behind eyes; submentum with one seta on each side.

Pronotum rounded-rectangular, distinctly wider than length, PW/PL = 1.34–1.35, widest a little before middle, posterior margin much narrower than greatest width, PBW/PW = 0.82–0.84. Anterior margin shallowly concaved at middle, slightly narrower than posterior margin, PAW/PBW = 0.71–0.74; anterior broadly rounded, weakly projecting; lateral margins evenly arched before middle, distinctly narrowed and nearly straight along

posterior half, not sinuate before posterior angles, posterior angles nearly right-angled, with a small denticle slightly projecting out. Basal foveae (Fig. 4H) with coarse and sparse punctures along inner and outer sulcus, as well as on base of intersulcate area; inner sulcus shallow with distinct boundary, slightly oblique to pronotum basal margin, base ending before pronotum basal margin; outer sulcus very faintly indicated, only represented by a few gathered punctures; a short and shallow basal sulcus usually present, medially not extending to the base of inner sulcus; intersulcate area flat; area between lateral margin and outer sulcus flat; lateral channels narrow, with very faint punctures. Pronotal disc without wrinkles aside median line; median line shallow.

Elytra oval and slightly convex, lateral sides distinctly expanded behind middle, BW/EL = 0.74–0.75. Elytral basal border slightly curved, forming an obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae punctate on basal third; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 absent (Fig. 4H). Parascutellar pore present; interval 3 with two setigerous pores, both adjacent to stria 2, first setigerous pore positioned near middle, the rest one near apical third; umbilical pore series on ninth interval sparse in middle, composed of 13–14 pores (5–6, 1–2, 6–7).

Fifth tarsomeres without seta ventrally.

Male sternite without secondary sexual modification, apex of sternite VII evenly rounded.

Median lobe of aedeagus (Fig. 25A) relatively slender in lateral view, ventral margin evenly curved along all the full length, apex weakly bent to the ventral side; apical orifice wide and short, weakly turned to left side, opened to the dorsal left surface of median lobe. Ventral surface without ridge. Apical lamella thin in lateral view; short and wide in dorsal view (AL/AW = 0.69–0.71), faintly turned to left side, gradually narrowed to apex, shaped a wide triangle, apex widely rounded, without denticle or tooth (Fig. 25B). Right paramere short, apex rounded (Fig. 25C).

Endophallus of male genitalia not studied due to restricted materials.

Gonocoxite 2 of female ovipositor small, widely crescent-shaped (Fig. 5N), sharp apically; outer margin with two ensiform setae in large size, length of the largest ensiform seta ca. 0.04 mm; dorsal margin with one ensiform seta near apical third, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical seventh of outer surface.

Distribution. The new species is known by two specimens collected from Shennongjia in Hubei Province and Wuxi County in Chongqing Municipality. These two collection sites are adjacent to each other, with a linear distance of about 50 km between them. The altitude of this species is relatively low, ranging from 1361 m to 1467 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Xiang Fu Ren": 时不可兮骤得 [Shi Bu Ke Xi Zhou De], 聊逍遥兮容与 [Liao Xiao Yao Xi Rong Yu]. This couplet can be translated as: The wonderful moments have passed, never to return. Let me roam at ease, with a leisurely air. Rongyu (容与) is a term used to depict a carefree scene in the poem. The name *rongyu* is proper for a *Pterostichus* species because these beetles are often seen running freely in the forest. The name is treated as a noun in apposition.

[14] *Pterostichus* (*Morphohaptoderus*) *chachi* sp. nov.

https://zoobank.org/B1D0243B-8C51-41DD-80AC-E0C829BE2723

Figs 4G, 5M, 26

Chinese vernacular name: 侘傺通缘步甲

Type material. ***Holotype*: Hubei** • ♂, labeled "China, W Hubei, 20. V. –7. VI., DASHENNONGJIA mts., 31.5N 110.3E, 2700 m, Jaroslav Turna leg., 2005." (CRS). ***Paratypes*** (a total of 4 ♀): **Hubei** • 2 ♀, the same data as holotype (CRS); • 2 ♀, labeled "Hubei Province, Shennongjia, Jinhouling, 2500 m, pitfall trap, 2013.VIII.15, Hao Huang leg." [in Chinese] (IZAS).

Diagnosis. Very small-sized species for the subgenus (BL = 4.6–4.7 mm), the smallest known *Pterostichus* species in China; elytra with linear microsculpture in females; antennae moniliform, antennomere 3 with accessory on apical half; pronotum slightly cordate, maximum width near apical third; basal foveae finely punctate, with faintly defined sulci; parascutellar pore absent; elytral interval 3 with three setigerous pores, the basal one adjacent to stria 3, the other two adjacent to stria 2; interval 1 with one setigerous pore near apex, adjacent to stria 1; fifth tarsomeres with two pairs of setae ventrally.

Comparisons. The new species, *P. chachi* sp. nov., is very special within the subgenus *Morphohaptoderus* and different from all other known species of the subgenus by the following distinctive characteristics: (1) Body size very small, BL = 4.6–4.7 mm, being the smallest species of the subgenus as well as the smallest one of *Pterostichus* from China; (2) elytra without parascutellar pore (Fig. 4G); (3) interval 3 with three setigerous pores, the first adjacent to stria 3, the other two adjacent to stria 2 (Fig. 26A); (4) interval 1 with one setigerous pore near apex (Fig. 26B, C).

Most of the above-mentioned characteristics are either unique or relatively rare within the subgenus *Morphohaptoderus*, with the details elaborated as follows. The previously known smallest *Pterostichus* species in China was *P. gongga* Sciaky, 1997, with a measured BL of 4.8–5.9 mm, which also belongs to the subgenus *Morphohaptoderus*. Besides *P. chachi* sp. nov., the parascutellar pore is absent only in two *Morphohaptoderus* species from Vietnam, *P. unisetosus* Fedorenko, 2023, and *P. glabellus* Fedorenko, 2023. Only two other species, *P. toledanoi* and *P. xuanzhang* sp. nov., both from Hubei, share a chaetotaxy on elytral interval 3 similar to that of the present new species. However, in these two species, the three setigerous pores on interval 3 are positioned relatively more posteriorly. Specifically, they are located at the basal fourth, near the middle, and the apical fourth, respectively. In contrast, in *P. chachi* sp. nov., these pores

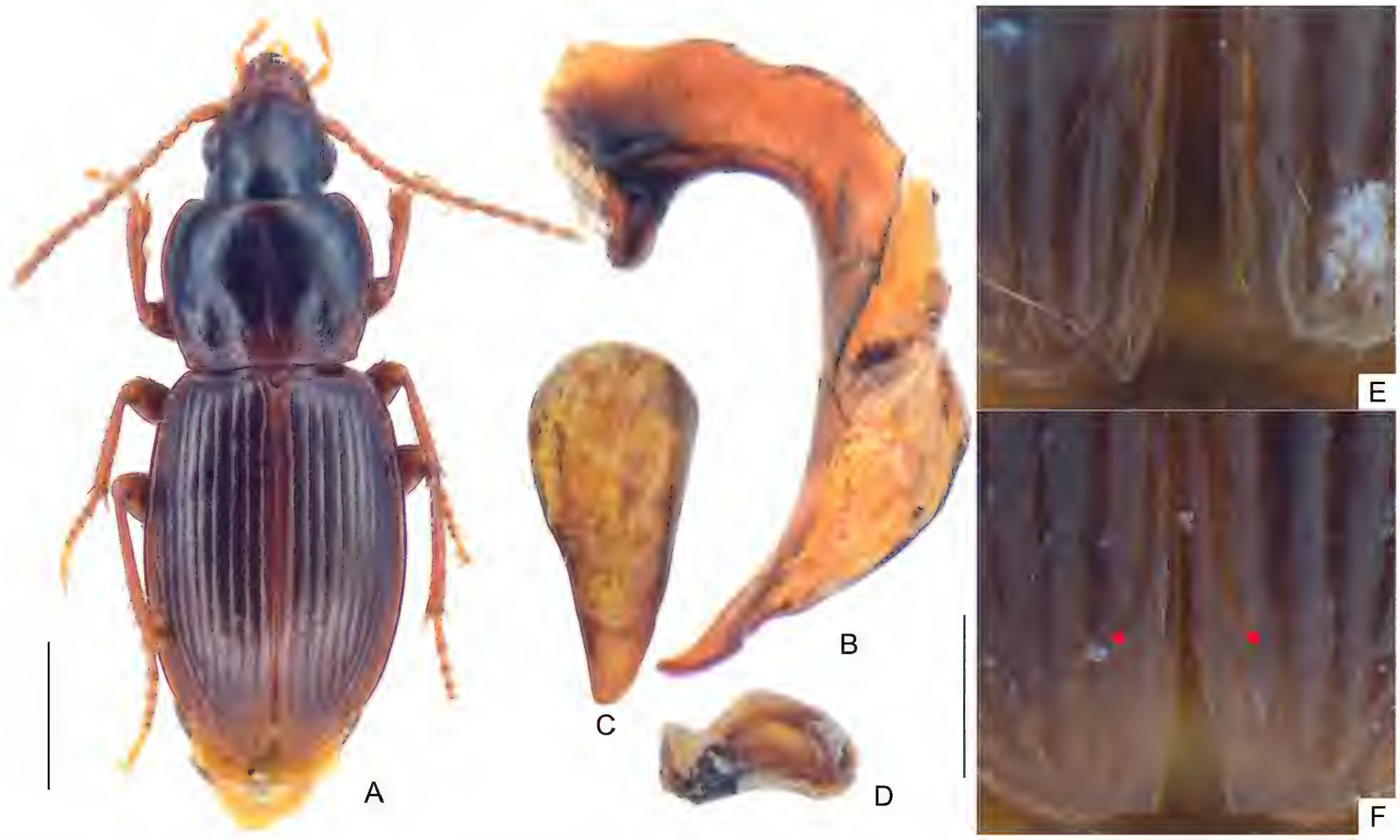

Figure 26. *Pterostichus* (*Morphohaptoderus*) *chachi* sp. nov. (**A, E–F.** Paratype; **B–D.** Holotype). **A.** Habitus, female; **B.** Median lobe of aedeagus, left lateral view; **C.** Median lobe of aedeagus, dorsal view; **D.** Right paramere; **E, F.** Elytral apex. Scale bars: 1.0 mm (**A–D**).

are more anteriorly placed, at the basal fifth, basal two-fifths, and apical third, respectively. Finally, the presence of a setigerous pore on interval 1 (Fig. 26B, C) is unique to *P. chachi* sp. nov. and has never been observed in any other *Pterostichus* species in China.

The general habitus of the new species *P. chachi* sp. nov. is somewhat similar to some small-sized *Morphohaptoderus* from Western China, such as *P. confucius* Sciaky & Wrase, 1997, *P. gongga* Sciaky, 1997, and *P. emei* Sciaky, 1994. But different from them by the smaller body size, distinctive chaetotaxy on elytra, and submentum with one seta on each side.

Description. BL = 4.6–4.7 mm, BW = 1.7–1.8 mm; dorsal surface brown to dark brown, elytra slightly lighter than head and pronotum, appendages brown; elytra with linear microsculpture in females (Fig. 26A).

Head slightly thickened, HW/PW = 0.62–0.64; frons without puncture; frontal sulci short and shallow; antennae moniliform, reaching elytral basal fourth, antennomere 3 with a few accessory setae on the entire surface of apical half; eyes relatively small, the length of tempora slightly shorter than the length of eyes; submentum with one seta on each side.

Pronotum slightly cordate, wider than length, PW/PL = 1.30–1.31, widest near apical third, posterior margin much narrower than greatest width, PBW/PW = 0.78–0.80. Anterior margin concave at middle, slightly narrower than posterior margin, PAW/PBW = 0.85–0.86; anterior angles broadly rounded, weakly projecting; lateral margins evenly arched nearly along their full length, more distinctly narrowed toward base, not sinuate before posterior angles, posterior angles obtuse-angled, with very faint denticle not projecting out. Basal foveae (Fig. 4G) shallow and finely punctate, punctures along inner and outer sulci, as well as on intersulcate area; inner and outer sulci without well-defined boundaries; inner sulcus straight and shallow, outer sulcus very faint, hardly recognizable; a basal sulcus fine but clearly defined, long and straight, medially extending beyond the base of inner sulcus, shortly bent to the front laterally, surrounding the inner side of the setigerous pore on posterior angle; intersulcate area slightly convex; lateral channels narrow, without puncture. Pronotal disc with very faint transverse wrinkles aside median line; median line shallow; basal median area with a few punctures close to inner sulcus.

Elytra oval and flat, humeral area distinctly narrowed, lateral sides curved and expanded near middle, BW/EL = 0.68–0.69. Elytral basal border nearly straight, forming a distinct obtuse angle with lateral margin, humeral tooth small, apex faintly pointed; striae without punctures, slightly crenulate on basal third; parascutellar striole joined to apical portion of stria 1, angular base of stria 1 absent or indicated by one or two isolated punctures. Parascutellar pore absent (Fig. 4G); elytral interval 3 with three setigerous pores, the first pore adjacent to stria 3, positioned near basal fifth, the other two pores adjacent to stria 2, near basal two-fifths and apical third respectively; interval 1 with one setigerous pore near apical sixth, adjacent to stria 1 (Fig. 26B, C); umbilical pore series on ninth interval sparse in middle, composed of 12–14 pores (5–6, 1–2, 6–7). Elytral apical margin shortly truncated, faintly denticulate at sutural angles (Fig. 26F).

Fifth tarsomeres with two pairs of fine setae ventrally.

Male sternite without secondary sexual modification, apex of sternite VII evenly rounded.

Median lobe of aedeagus (Fig. 26B) relatively slender; in lateral view, ventral margin bent near basal fourth, nearly straight at middle portion before apical fourth, slightly sinuate at apical fourth, apex distinctly bent to the ventral side; apical orifice relatively small, weakly turned to left side, opened to the dorsal left surface of median lobe. Ventral surface without ridge. Apical lamella thin in lateral view; narrow and relatively long in dorsal view (AL/AW = 1.56), faintly turned to left side, gradually narrowed to apex, shaped a narrow triangle, apex rounded (Fig. 26C); lamellar denticle very small and faint, present near basal third of left margin. Right paramere short, apex rounded and extremely small (Fig. 26D).

Endophallus of male genitalia not studied due to restricted materials.

Gonocoxite 2 of female ovipositor small, widely crescent-shaped (Fig. 5M), slightly obtuse apically; outer margin with two or three ensiform setae of normal size, length of the largest ensiform seta ca. 0.03 mm; dorsal margin with one ensiform seta near middle, ridged between the ensiform seta and apex of gonocoxite 2, one nematiform seta located on the apical fifth of outer surface.

Distribution. This species is only known from Jinhouling in Shennongjia, Hubei Province. It is distributed at a high altitude of about 2500 m.

Etymology. The scientific name of the new species is derived from Qu Yuan's work "Ai Ying": 惨郁郁而不通兮 [Can Yu Yu Er Bu Tong Xi], 蹇侘傺而含戚 [Jian Cha Chi Er Han Qi]. This couplet can be translated as: My mood is heavy with melancholy. I stand alone, filled with sorrow. It describes the poet's sorrowful mood after the fall of the capital of Chu and the humiliation of King Chu by the people of Qin. Chachi (侘傺) describes a scene of standing alone in dejection in the poem. As a specific name, *chachi* implies that the new species is very rare, with only one sex having been discovered. The name is treated as a noun in apposition.

Distribution of Morphohaptoderus species in Hubei

In this study, we investigated the fauna of *Morphohaptoderus* from two localities in Hubei Province: the Shennongjia National Park and Houhe Reserve in Wufeng County (Fig. 27). The results reveal the surprisingly high species richness of *Morphohaptoderus* in Hubei. Additionally, unidentified female specimens suggest the presence of several undescribed species in these two regions. All fourteen species were collected in deciduous broad-leaved forests or mixed forests dominated by *Quercus* spp. and various coniferous trees at altitudes above 900 m. Similar habitats are widely but discontinuously distributed in western Hubei. Therefore, numerous new species are anticipated to be discovered in future investigations.

In the Houhe Reserve of Wufeng County, only one site was investigated (alt. 900–1000 m), with three sympatric species collected. In contrast, we have plenty of specimens collected from twelve collecting sites in Shennongjia (Fig. 28). These sub-localities are mainly adjacent to the tourist driveway in Shennongjia National Park, with altitudes ranging from 1361 m to 3090 m. We delineated species-specific distribution patterns for the eleven species (Fig. 28, Table 1). Our results reveal

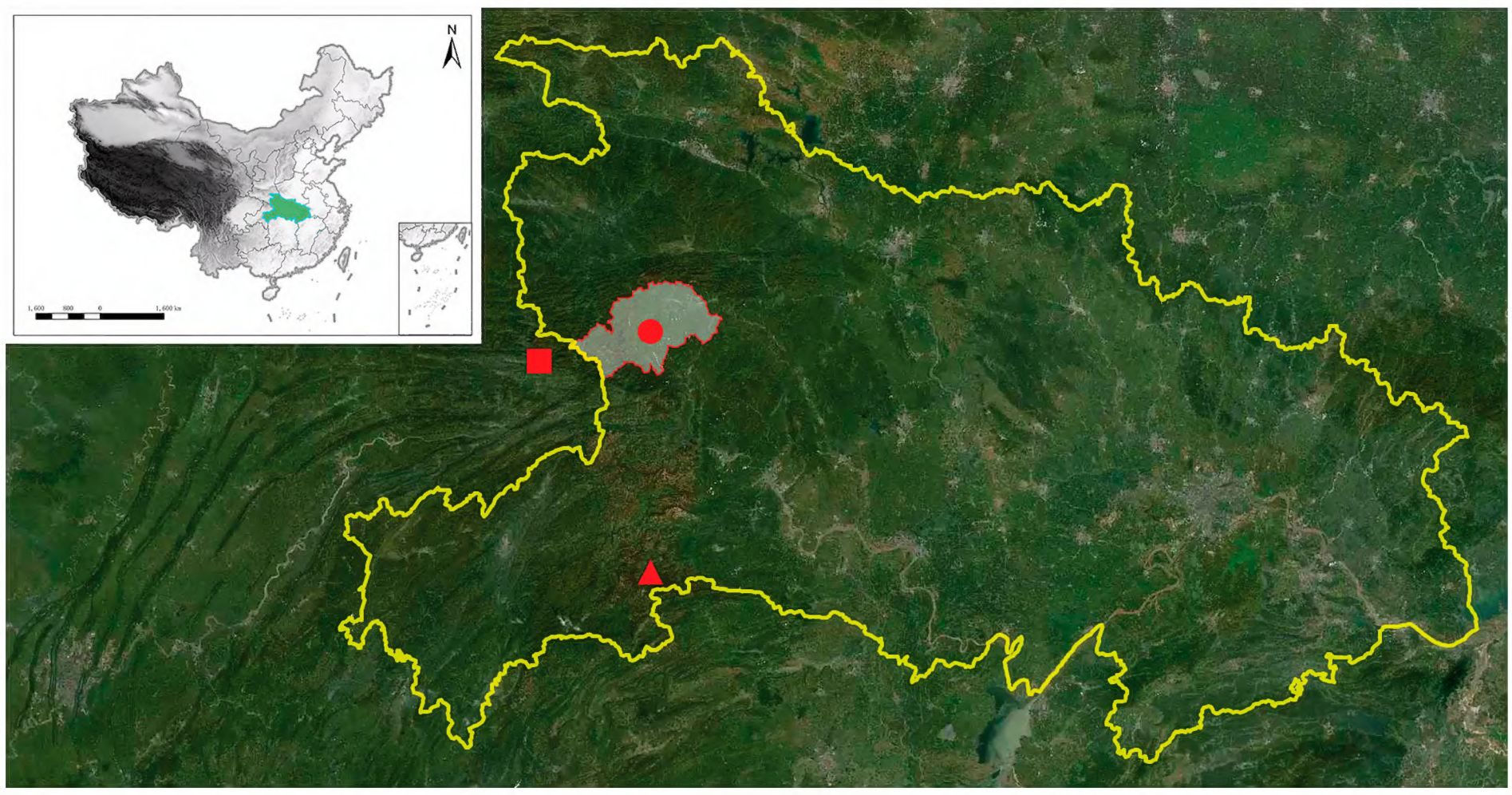

Figure 27. The two investigated sites for *P.* (*Morphohaptoderus*) spp. in Hubei Province and an adjacent site in Chongqing Province. Circle: Shennongjia; triangle: Houhe Reserve in Wufeng County; square: Yintiaoling Nature Reserve. The range of Shennongjia Forestry District is outlined in red and shown in detail in Fig. 28.

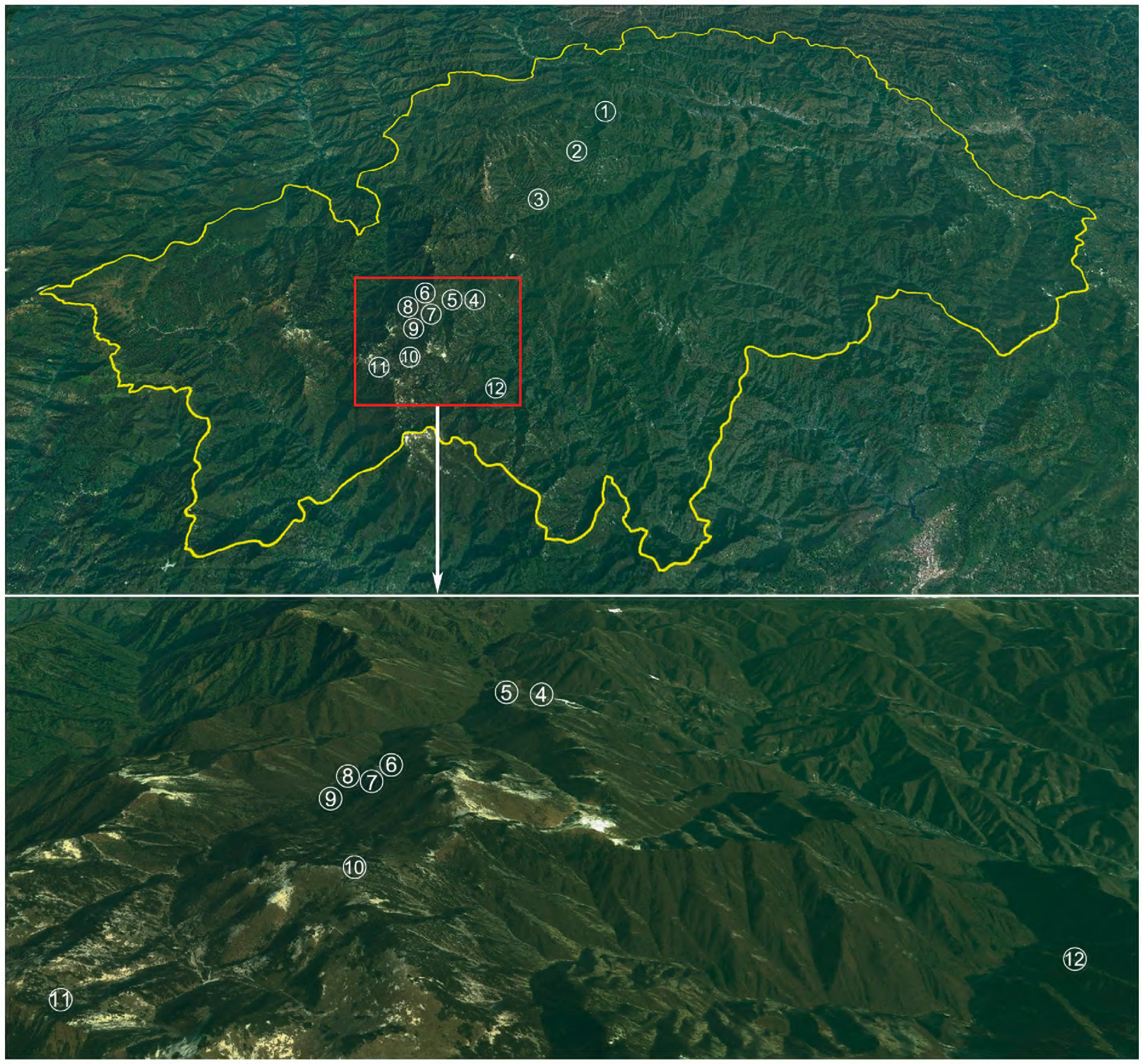

Figure 28. Geographical distribution of *P.* (*Morphohaptoderus*) spp. in Shennongjia Forestry District, Hubei. 1 Yanziya, alt. 2300 m; 2 Yixiantian, alt. 1500 m; 3 Wenshui Village, alt. 1700 m; 4 Shennongding Scenic Area Entrance, alt. 1884 m; 5 Jiuhuping, alt. 1800–1950 m; 6 Jinhouling, alt. 2500 m; 7 Xiaolongtan, alt. 2200 m; 8 Jinhouling Crossroad, alt. 2200 m; 9 Hongping Town, alt. 2500 m; 10 Shennongding, alt. 2890–3090 m; 11 Badongya, alt. 2700 m; 12 Guanmenshan, alt. 1361 m. The detailed distributions for the 11 species in the 12 sub-localities of Shennongjia are shown in the table below.

Table 1. Distribution of 11 species in 12 collecting sites in Shennongjia Reserve. Serial numbers indicate localities in Fig. 28.

Species/Localities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Altitude (m)	2300	1500	1700	1884	1800 –1950	2500	2200	2200	2500	2890 –3090	2700	1361
P. dentellus	√		√	√	√	√		√	√			
P. quyuani sp. nov.	√		√	√		√		√	√	√		
P. shennongjianus	√	√	√	√		√	√	√	√		√	
P. lisao sp. nov.			√	√								
P. lingjun sp. nov.												√
P. hubeicus	√		√	√		√	√	√				
P. yaotiao sp. nov.		√	√									
P. toledanoi						√				√	√	
P. xuanzhang sp. nov.					√	√					√	
P. rongyu sp. nov.												√
P. chachi sp. nov.						√						

that these species exhibit evident altitudinal differentiation (Fig. 29), although five species (*P. shennongjianus*, *P. dentellus*, *P. hubeicus*, *P. quyuani* sp. nov., and *P. xuanzhang* sp. nov.) have relatively wide altitudinal ranges, among which the first four are the most common species in Shennongjia. For the remaining species, *P. lingjun* sp. nov. and *P. rongyu* sp. nov. are confined to Guanmenshan (alt. 1361 m) in the lower mountain

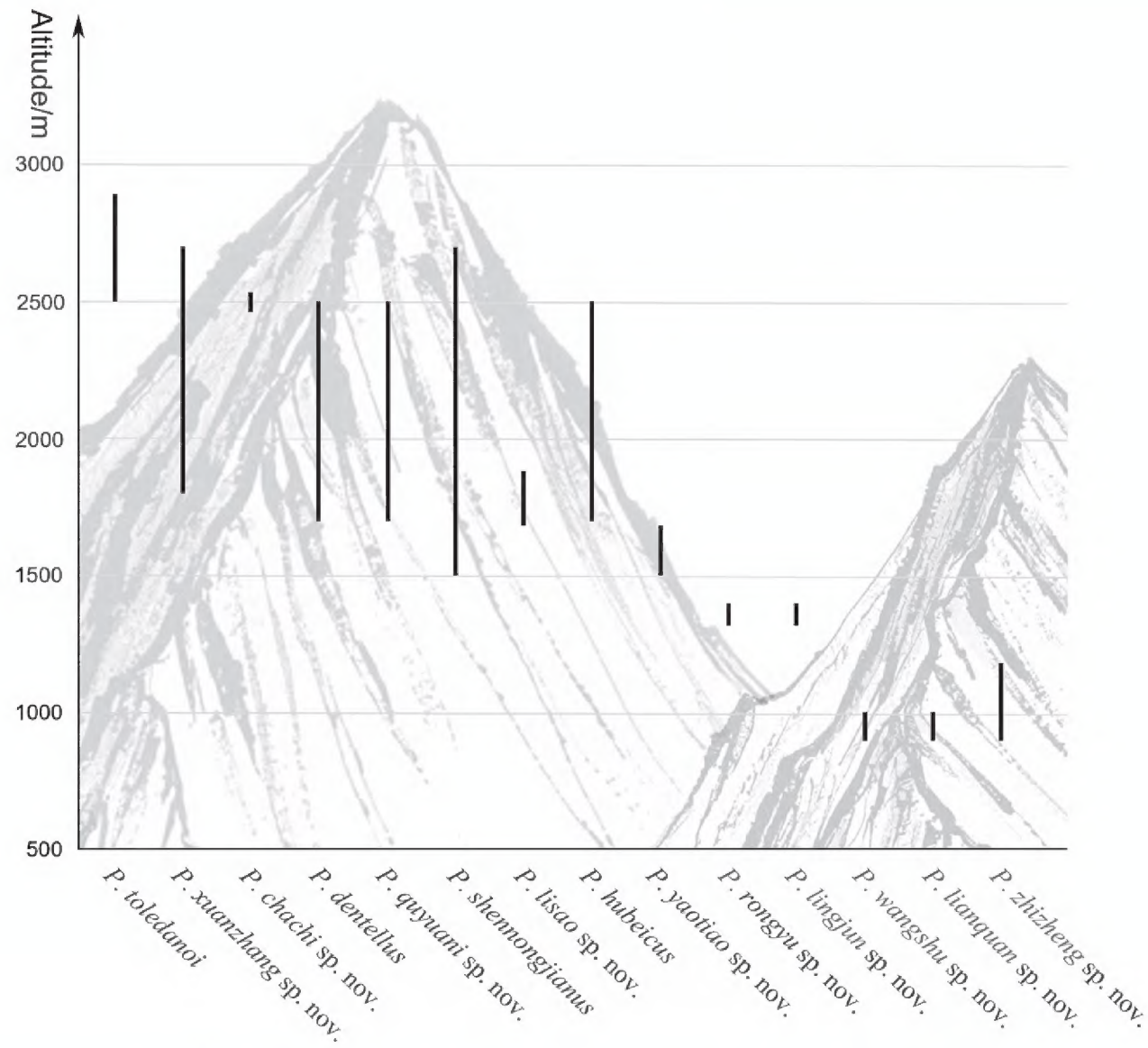

Figure 29. Altitude ranges for 14 species of *P.* (*Morphohaptoderus*) spp. in Hubei Province. The left 11 species are from Shennongjia (highest peak 3106 m), the right three species from Houhe Reserve in Wufeng County (highest peak 2250 m).

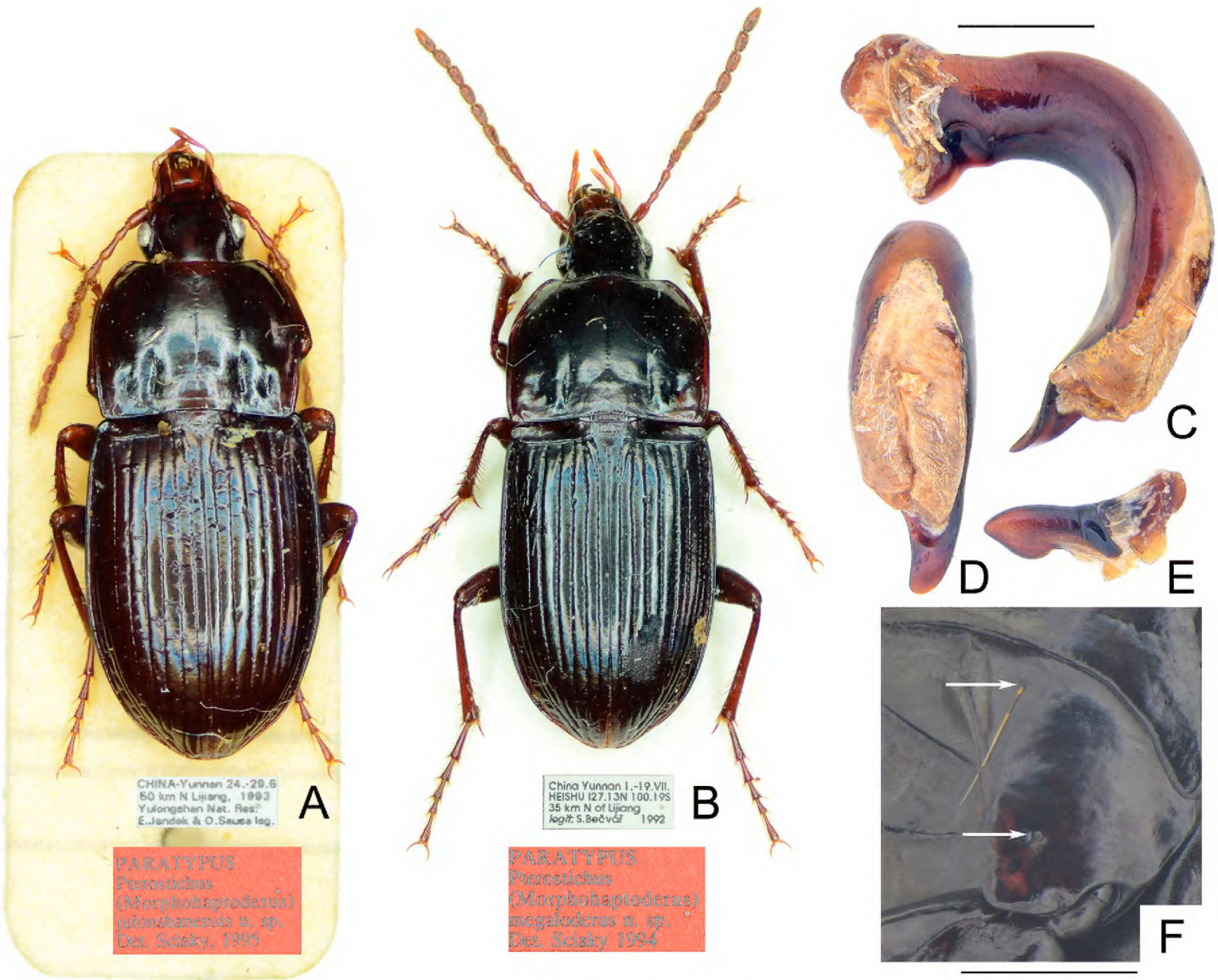

Figure 30. Habitus of *P.* (*Neohaptoderus*) spp. **A.** *P. yulongshanensis*; **B–F.** *P. megaloderus*. **A.** Paratype; **B.** Paratype; **C.** Median lobe of aedeagus, left lateral view; **D.** Median lobe of aedeagus, dorsal view; **E.** Right paramere; **F.** Metacoxae. Scale bars: 0.5 mm.

zone; *P. yaotiao* sp. nov. occurs exclusively at Yixiantian and Wenshui village (alt. 1500–1700 m); *P. lisao* sp. nov. is only found at median altitude sites (1700–1884 m); and *P. toledanoi* and *P. chachi* sp. nov. predominantly inhabit alpine areas at Jinhouling and Shennongding (alt. 2500–2890 m).

Patterns emerge from species distributions in Shennongjia (Table 1). At Guanmenshan, the lowest collecting site in Shennongjia, only a few specimens of two species were collected, and both occur exclusively there. Similarly, on the highest peaks, about 3000 m, only two species were collected: *P. toledanoi* and *P. quyuani* sp. nov. In contrast, species richness is substantially higher at mid-elevation sites. For exbroad, seven sympatric species were collected at Jinhouling (alt. 2500 m).

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